ELECTRICAL WORLD

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NOVEMBER 5, 1932

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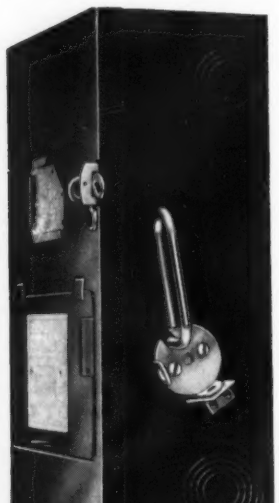
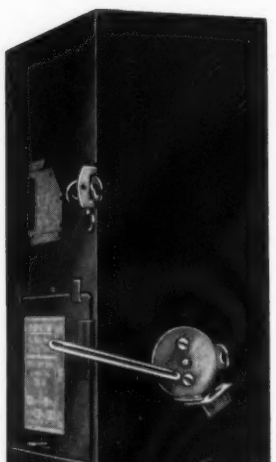


THE NEW MURRAY ACCESSIBLE FUSE SWITCHES

have that distinctive feature of bringing fuses to view in one operation.



Left

SWITCH HANDLE IN "OFF" POSITION

Service is disconnected but fuses are not accessible until handle is brought to "Open Door" position.

Above

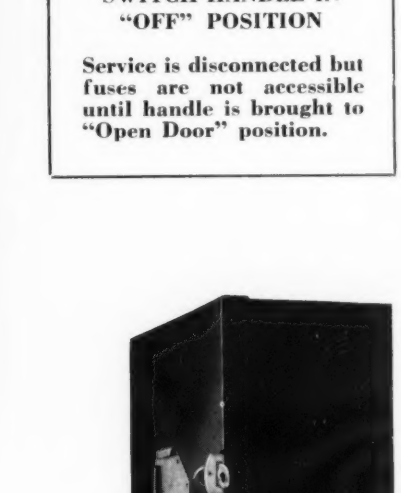
SWITCH HANDLE IN "ON" POSITION

Auxiliary door for fuse accessibility cannot be opened while switch handle is in the "On" position.

Right

SWITCH HANDLE IN "OPEN DOOR" POSITION

Auxiliary door automatically opens for fuse accessibility when handle is in "Open Door" position. All exposed parts are dead.



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ELECTRICAL WORLD

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for the Week Ending

November 5, 1932

Insull Extradition Nears by Presidential Warrant

Governor Emmerson of Illinois has signed a requisition for a presidential warrant for the extradition of Samuel Insull from Greece and of Martin Insull from Canada to answer charges of embezzlement in connection with the affairs of their holding companies now in receivership. Two officials of Cook County, Illinois, have been waiting in Washington for the warrant and will leave for Greece at once to effect Samuel Insull's return when it is delivered to them.

Recent developments indicate that the Greco-American extradition treaty was signed by President Zaimis of Greece on October 22 and forwarded to Washington. Delay in action under this agreement is said to rest upon the failure of the State Department and the Greek Minister in Washington to agree upon clarification of a few words in the treaty which through ambiguity have delayed its ratification.

Samuel Insull, Jr., is reported to be well on his way back to Chicago from brief stays in Paris and London. Bank loans of the United Public Service System, a subsidiary of Middle West Utilities, are announced by Samuel W. White, receiver, to have been materially reduced along with operating expenses. Commonwealth Edison, foremost property of the Insull empire and one wholly untouched by the holding company failures, reports earnings of $8.95 a share, as against $11.91 for the same period in 1931. A preliminary audit on behalf of Middle West noteholders indicates between 14 and 20 cents on the dollar for some investors.

A discrepancy of about $3,000,000 is reported in the books of the Corporation Securities Company as disclosed by attorneys for the receivers. The alleged discrepancy is said to have been inadvertently revealed by two of the company's former officers in compiling its history for the receivers.

I have stated unceasingly that I am opposed to the federal government going into the power business. I have insisted upon rigid regulation. . . . It appears to me that we are justified in the conclusion that our opponents propose to put the federal government in the business.

HERBERT HOOVER

President Hoover referred in his New York speech this week to the instructions to campaign speakers issued by the Democratic national committee that they are to criticise "my action in the veto of the bill which would have put the government permanently into the operation of power at Muscle Shoals."

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N.E.L.A. Prizes for 1933 Announced by Committee

Awards to be made in 1933 under the auspices of the National Electric Light Association have been announced by the prize awards committee. Papers and exhibits to be eligible must be forwarded by March 1, 1933, to the association. Winners will be announced as usual at the national convention of the association, rumored to be held in Chicago.

Prize awards for which individuals may compete will be the Doherty, Davidson, Lindemann, Byllesby, Forbes and McGraw awards. Prizes for which companies may compete will be the Curtis, Gilchrist and Martin awards. The Hughes prize will not be awarded in 1933 since it covers achievements made during that year.

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Bond Issue Approved to Avert Receivership

In a majority decision the Massachusetts Department of Public Utilities last week approved the petition of the Lowell Gas Light Company for authority to issue $950,000 in 5.5 per cent, fifteen-year mortgage bonds at not less than par in order to avoid a threatened receivership resulting from the loan by the company of funds to the American Commonwealth Power Associates, now insolvent. The transaction left the company with an indebtedness of $1,500,000, which it is now unable to pay, substantially all the notes being held by banks and savings institutions. Massachusetts has not made a practice of permitting the issuance of stock or bonds to reimburse the treasury for capital outlays, but in this case the board holds that to grant the petition cannot violate the statutes as the proceeds of the bond sale will be used to pay the overdue notes.

The commission held that it is preferable to avoid receivership proceedings if no burden thereby is thrown upon the ratepayer, and this will follow if the outstanding capital is made no greater than if the notes of $1,500,000 had not been issued. Earnings which would otherwise be distributed to stockholders as dividends will be used in the retirement of the notes as the company works out of its difficulties.

50 Ohio Cities League on Utility Problems

Determined to present a united front on utility rate questions, officials of about 50 Ohio municipalities have formed the Ohio Association on Public Utilities Questions to co-operate toward "just rates" for municipalities, investigation of various utility organizations and establishment of a bureau of information.

The constitution provides for a co-operative movement among the municipalities for obtaining necessary legislation, litigation and negotiation on rate questions. A bureau of information for use of all the towns is to be established in Columbus.

A majority of the municipalities represented at the conference are engaged in rate controversies or have recently brought rate cases to a close. The meeting was called by officials of half a dozen cities who desired to unite in an effort to solve their various utility rate problems.

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Contractors Found Business Through Rewiring Campaign

As the result of a seven-week campaign, in which five local contractors participated, a total of $5,084 worth of rewiring business has been developed in Spartanburg, S. C. This represented $145 a week of otherwise unobtained business for each participating contractor.

The campaign was developed through a friendly competition and point-scoring system for various classes of work. Calls were made upon a prospect list of about 500 names, selected upon a credit and home-ownership rather than home-rental basis. A letter indicating the value to the home owner of the various rewiring improvements which could advantageously be made was followed by personal calls to emphasize the matter and secure the actual orders. Spartanburg is a community of approximately 30,000.

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Licensed-Company Audits Speeded by Federal Board

Announcement has been made by the Federal Power Commission that the board as at present composed, formed in December of 1930, has accomplished more toward the determining of the net investment in licensed power plants on government lands and navigable streams than was done in the previous ten-year period of operation of the commission after the federal water-power act was passed in June of 1920.

As of June 30, 1931, out of a total of $637,000,000 of claimed investment in licensed power projects, only $35,000,000 in accounts had been audited and the cases settled. Only $97,000,000 of claimed investment had been audited and was awaiting final action by the new commission. Since then cases involving more than $14,000,000 have been closed, but the greatest advance has been in the number of cases in which audits have been completed, the amounts involved in this category having been increased from $97,000,000 to $277,000,000. Claimed investment amounting to $14,000,000 has been allowed to the extent of approximately $11,000,000.

Before final commission action can be taken on any case involving the determination of net investment there must be a complete audit by the commission's accounting staff. After the audit has been completed public hearings are held to give the companies opportunity to protest disallowances proposed by the commission's staff. These hearings are now being held as rapidly as possible. Since June 30, 1931, eight hearings have been held, involving approximately $30,000,000. Five more hearings are scheduled for early dates in the future, involving approximately $25,000,000 more.

▼

Pennsylvania Investigation Shifts Phases Rapidly

Running through several possible clues without achieving any definite action or important facts, the Pennsylvania Senate's investigatory committee discreetly adjourned on October 28 until after Election Day. Early in the hearings last week such varied topics were touched upon as the actions of the Penn Central Light & Power Company in certain financing moves and its relationship to the Insull empire, capital write-ups of the Duquesne Light Company, publicity and public relations work costs of various utilities and the propriety and facts behind the charges of Governor Pinchot in connection with the financial affairs of former Commissioner James S. Benn.

A clash between Oliver K. Eaton, counsel for the Senate utility investigation committee, and Clyde L. King, chairman of the commission, early developed when the commission refused to

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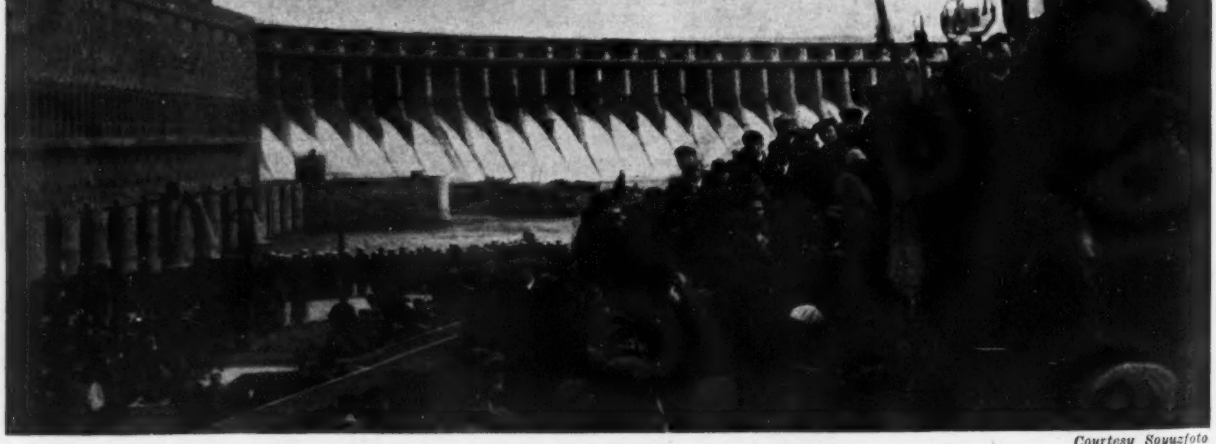
WHEN DNIEPROSTROY WAS DEDICATED



Courtesy Soyuzfoto

Flanked by a battery of microphones, Comrade Ordjonidze, People's Commissar for Heavy Industry, and Comrade Kalinin, President of the U.S.S.R., did the honors at the dedication of the 756,000-hp. Soviet station on the Dnieper River on October 10 ("Electrical World," October 15, page 515; August 27, page 257.)

furnish requested data regarding Duquesne Light write-ups as compiled by the commission from company reports.

Most tangible of clues to date had to do with the purchase and sale of Pennsylvania Water & Power Company securities by or for James S. Benn, former commissioner, through his son-in-law. It was alleged by Oliver K. Eaton that Mr. Benn had purchased stock through his son-in-law. This was substantiated in part by Joseph W. Gross, investment banker of Philadelphia and a director of the Pennsylvania Water & Power Company.

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Corporate Publicity Urged by Investment Bankers

That old familiar insistency—"Give the investor the facts"—cropped up once more at the Investment Bankers' Association meeting at White Sulphur Springs, W. Va., last week and was given renewed potency through the presentation of the report of the public service securities committee. This emphasized also the growing importance of valuation questions, improved ethics in management and finance and the place of the holding company.

The report of the committee read:

"The year just past has been so exceptional that it is impossible to compare it with previous years. The rapid and drastic changes in economic conditions make it seem futile to discuss on any comparative basis valuations, earnings and rates charged for services rendered. These problems all require a certain degree of stability and a definite trend if they are to be profitably discussed. Until fundamentals are settled, other subjects should not be allowed to intrude, and at present such absolute fundamentals as honesty in management and soundness of money are so unsettled that they are topics of major interest. Of course, as soon as some degree of stability is restored, other subjects will again become matters of prime importance in their effect on public service securities.

Operating company securities

"In particular, the question of the basis of valuation will probably soon be raised in political circles, but for the present this does not seem to be a major menace. It is pleasant to think, however, that in spite of the bad times the holders of securities of public service operating companies have on the whole fared better than the holders of securities of any other type.

"At a time when basic and fundamental conditions are rapidly changing it seems desirable, if possible, to point out a fundamental weakness that has been brought into prominence and to indicate the course to be followed in order to eliminate this weakness. There is one such weakness, not confined exclusively to public service securities by any means, but which is largely present in the public utility field, that has become very prominent during this period of depression. This refers to the secrecy sometimes present in holding companies. Capitalizations utilizing holding companies have been at times employed in the public utility field and the opportunity for questionable practices, if not absolute fraud, has been emphasized during difficult economic conditions. It is unnecessary to give examples. Every one with the least familiarity with this subject can supply plenty of examples from his own knowledge. It would seem, however, that as a result of the past year's experience in the employment of holding companies the corporate form should be as simple as possible and that frequent and detailed statements of everything affecting the earnings and financial condition of all the companies involved should be given to the public so that security holders may not be deceived by complicated intercompany transactions or intercompany contracts and may have the fullest possible information on which to estimate the value of their securities.

"Reputable firms should refuse to deal in the securities of companies that do not give such information and should not recommend them to their customers. Finally, the pertinent information should be contained in circulars and advertisements in such form that actual conditions are simply and clearly represented."

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Gilbert Station Producing a Kw.-Hr. for 12,000 B.t.u.

Once more assuming its share in the production of power for the Pennsylvania and New Jersey groups of the Associated Gas & Electric System, the 1,250-lb., 55,000-kw. steam turbine in the Gilbert station of the New Jersey Power & Light Company at Holland, N. J. (the most economical though not the largest of several stations feeding this system), has resumed the economical operation maintained ever since it started 2½ years ago. Aside from incidental repairs, the operation of this station was not interrupted until the summer of this year, when difficulties developed in the low-pressure unit. At the present time Gilbert station is producing a kilowatt-hour for about 12,000 B.t.u., or 0.888 lb. of coal. It is operating with a maximum output capacity of 55,000 kw., corresponding to an average at 43,000 kw. of sustained output, which practically represents its regular duty ever since it started.

Service was interrupted this summer for 71 days when on June 28 the 43,200-kw. low-pressure unit was shut down following evidences of excessive vibration. Examination disclosed a failure in the third-stage wheel of the low-pressure unit, which also had damaged the fourth-stage wheel. The spindle was sent to the factory for repairs and the unit was returned to service on September 8.

According to C. A. Greenidge, vice-president of Utility Management Corporation, which manages the subsidiaries of the Associated Gas & Electric Company, the cause of the failure has not been positively identified. After the trouble occurred the turbine operated for about fifteen hours up to the end of the day's run with entire ease, but at considerably reduced load. During the subsequent suspension of station operation the other stations carried without difficulty the load ordinarily assumed by Gilbert station.

Trade Slows Seasonally; Commodities Weaken

Indications of seasonal weakness in trade indexes begin to appear. Car loadings for the first time in several weeks have fallen off. General indexes show less strength. Most disturbing of all is the continued drop in commodity prices; these have lost three-fourths of the gains made since last May. Wheat is selling at a historic low price. Encouraging short-time elements are the rise in employment figures and the trend in energy production.

On trial today, and about to be tried by fire, is no less an idol than the much-vaunted American standard of living. Other countries with greatly depreciated currencies and lower standards of living are able to dump goods and commodities in our market at prices which it is impossible under present conditions for us to match. We may let our domestic producers be overwhelmed in the deluge, we may raise a tariff wall so high that nothing can be imported in sufficient volume to affect home trade, or we may adjust capital and wage charges against producton to today's levels and fight through. As holders of virtual mortgages against the greater part of the commercial enterprise of the world we are interested, or should be, in the solvency and continued existence of our debtors. Can America do the seemingly impossible?

There has been little accomplished and perhaps little can be done, pending an awakening, to settle the fundamentals of today's problems until we are willing courageously to face the facts of—debts which at present cannot be paid by nations or individuals, the stagnation of world trade, the rising tide of public expenditures, the appalling bulk of stocks of raw materials, scarcely decreased at all in the past lean years, and where fully consummated inflationary moves will really take us.

Trade is the lifeblood of the modern world and today that blood is all but frozen in the veins of the body that it must vitalize.

Coming Meetings

National Association of Railroad and Utilities Commissioners—Hot Springs, Ark., Nov. 15-18. James B. Walker, 270 Madison Ave., New York.

American Society of Mechanical Engineers—Annual meeting, New York, Dec. 5-9. C. W. Rice, 29 West 39th Street, New York.

American Association for the Advancement of Science—Annual convention, Atlantic City, N. J. Dec. 27-31. C. F. Roos, Smithsonian Institute, Washington, D. C.

American Physical Society — Annual meeting, Atlantic City, Dec. 28-30. W. L. Severinghaus, Columbia University, New York.

American Institute of Electrical Engineers—Winter convention, New York, Jan. 23-27. H. H. Henline, 33 West 39th Street, New York.

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Columbia Stock Transfers Revealed at Inquiry

Further evidence concerning activities of the Columbia Gas & Electric Corporation was presented at the Federal Trade Commission hearings last week. Security exchanges of and with underlying properties occupied most of the testimony.

At one session Robert J. Ryder, commission examiner, testified that the Columbia Gas & Electric Corporation had capitalized a total of $56,361,000 of surplus from subsidiaries it acquired between 1926 and 1930. He said that the corporation placed a value of $455,048,796 on its acquisitions, but that this figure had been reduced through disposals and sales of subsidiary investments to $286,286,169, of which $56,361,000 represented surpluses. The propriety of capitalizing surpluses was the subject of previous testimony and was declared by Robert E. Healy, chief counsel of the commission, to be a controversial question.

The return to Columbia Gas on its invested capital, after giving effect to surplus accumulations and reserves other than for depreciation, ranged from 5.72 per cent to 14.02 per cent for the years 1927 to 1930 inclusive, the Federal Trade Commission was told. According to Mr. Ryder the main source of income is from dividends received on its investments in operating utility companies. In addition, it receives the net earnings of several companies, the stocks of which are leased to the corporation. Of the total expenses for the period 1926 to 1930, inclusive, it was pointed out, 66 per cent represents interest paid on borrowed money, approximately 9 per cent represents leased rentals and the remaining 25 per cent represents operating expenses, including depreciation and taxes.

Columbia Gas & Electric Corporation filed a formal statement this week with the Federal Trade Commission to the effect that the so-called "write-up" of $36,000,000 (ELECTRICAL WORLD, October 29, page 578) had been justified by the value received. The statement was placed in the record by E. Reynolds, Jr., vice-president and secretary of the corporation, during the testimony of R. J. Ryder, commission examiner.

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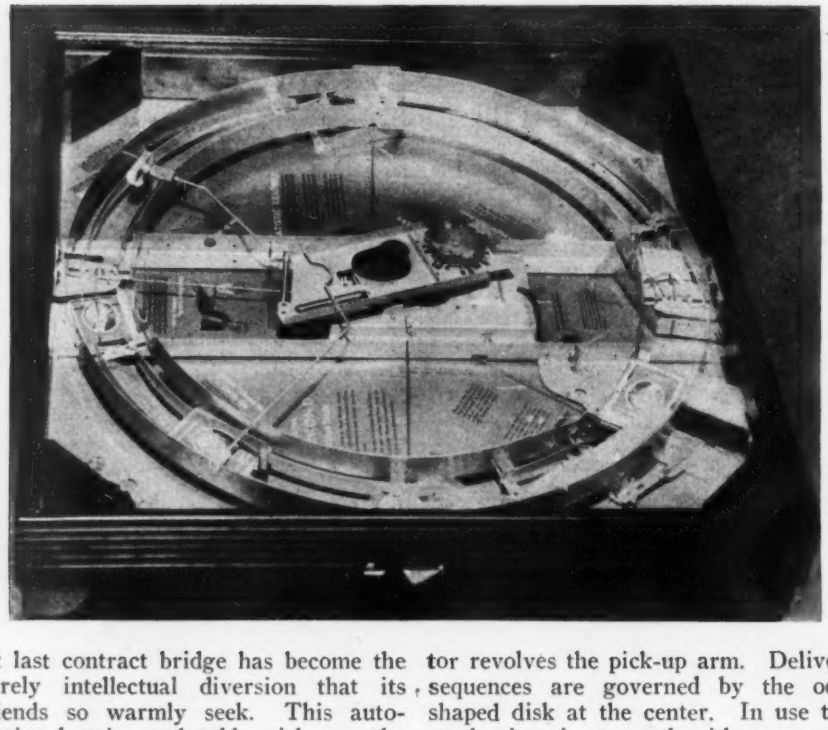
Electrical Help for the Tired Card Player



At last contract bridge has become the purely intellectual diversion that its friends so warmly seek. This automatic electric card table picks up the cards from a drawer before each player, shuffles them and deals them (never twice in the same way). A small motor revolves the pick-up arm. Delivery sequences are governed by the odd-shaped disk at the center. In use this mechanism is covered with a conventional tabletop and only the compartment before the player telltales the latest triumph for the lazy.

New Rural Service Plan Studied in Illinois

At a hearing before the Illinois Commerce Commission a proposal submitted by the Central Illinois Public Service Company to standardize allocation of the cost of construction of rural electric line extensions according to a new plan was discussed. Under the proposed scheme the company would pay the cost of constructing a power line on a farmer's property up to 300 ft. from the public highway providing the farmer chooses to place himself under the $9 a month minimum rate. If the farmer lives more than 300 ft. from the road he would pay for erecting the required additional distance. Under the old plan extensions sometimes were made requiring a distance of eight or ten poles on a farmer's land. The cost of this construction theoretically was borne by the company, but actually fell upon other farmers in the community. A farmer living more than 300 ft. from the highway was favored at the expense of other farmers living only 300 ft. or less from the highway.

The company, under the new plan, reserves the right to discontinue service to any customer who does not maintain the lines beyond the 300-ft. limit in a safe condition. The company will do such maintenance as may be required providing the customer pays the cost of maintenance.

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Wisconsin Telephone Case Carried to Supreme Court

An appeal to the U. S. Supreme Court was granted October 24 in the case involving an order of the Wisconsin Public Service Commission for a 12½ per cent reduction in the Madison rates of the Wisconsin Telephone Company. The company had petitioned the commission for a 25 per cent increase in rates (ELECTRICAL WORLD, July 9, 1932, page 34). Judges F. A. Geiger and Louis Fitz-Henry of the U. S. District Court signed the order allowing the appeal of the Public Service Commission from their decision granting an interlocutory injunction against enforcement of the reduction. Their order directed the telephone company to file its briefs with the highest court by November 21.

The commission sought reversal of the interlocutory injunction on the

grounds that the court erred in not finding any facts or legal conclusions which showed confiscation of the company's property by the rate reduction ordered, as the company alleged; by abusing its discretion and arbitrarily granting the interlocutory injunction; by not reserving to the defendant Public Service Commission any power to make the rate reduction, which the court enjoined, by way of a permanent order after completion of its investigation or after the order expired July 1, 1933; by holding that the rate prescribed by the order would result in confiscation of the company's property, and by granting an interlocutory injunction and enjoining the commission from compelling the telephone company to put into effect the 12½ per cent reduction.

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Commission Asserts Control Over Utilities' Securities

In an order which partially refused the petition of the Metropolitan Edison Company for dismissal of complaints by minority stockholders, the Pennsylvania Public Service Commission has asserted its right to investigate the use of money obtained from bonds issued by public utility companies and to prosecute officers who violate the law in this connection. The commission, however, has, on petition of the Metropolitan Edison Company, dismissed the other complaints of minority stockholders in which an investigation of the corporate structure of the company and its holding company, the Associated Gas & Electric Company, was asked (ELECTRICAL WORLD, October 1, page 421) on the ground that it has no jurisdiction over Associated Gas because it is not a public utility doing business in Pennsylvania.

The stockholders alleged mismanagement of the Metropolitan company, contending that its cash or surplus funds were used to purchase securities of companies affiliated with the Associated system.

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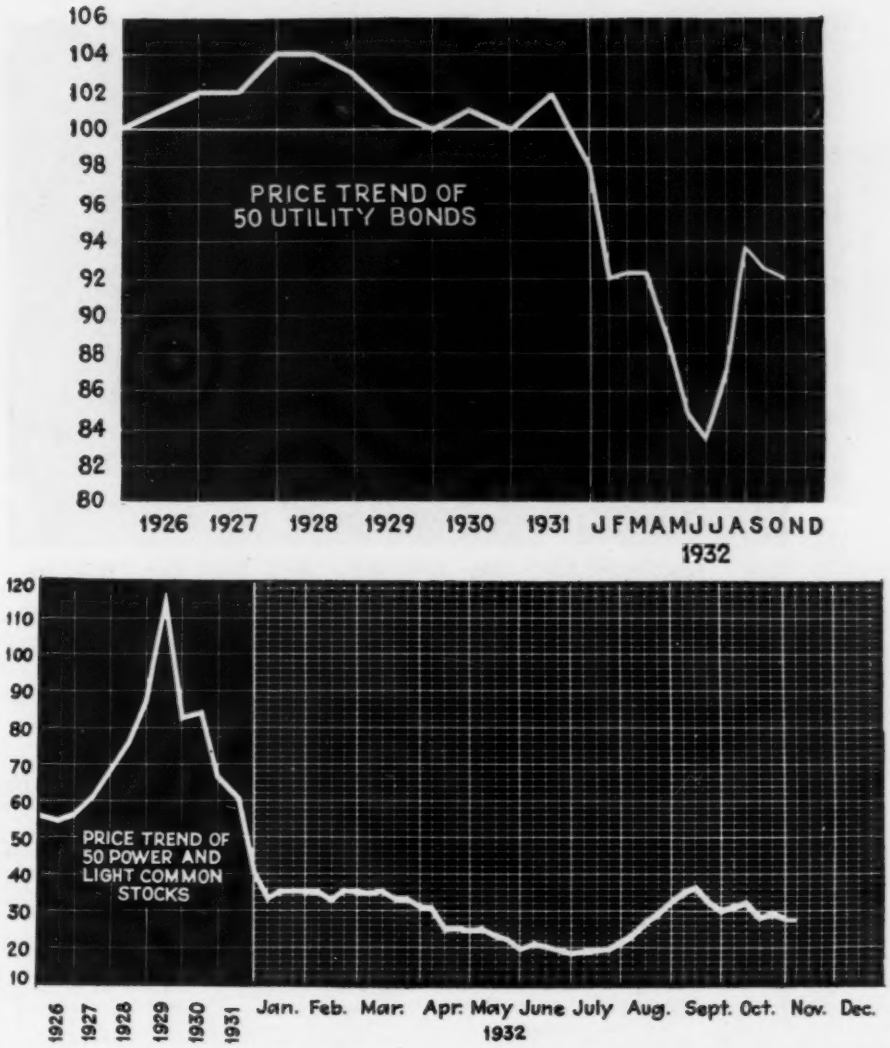
October Financing Rises, Average Yield Lower

Resumption of utility financing, which dropped to $7,746,000 in September, is indicated by the total of $60,000,000 for the month just ended. The average yield of 5.25—the lowest of the year—may be taken as an added indication of improvement in the electric light and power security market. New financing for the ten months ended October 30, however, is still far below last year, being but $365,303,800, as compared with $1,139,420,000 in 1931. The success of recent issues may lead to the bringing out of many other utility issues in the future, provided that the market retains the strength now shown. New England Power Association issues, including the $18,000,000 offering of bonds by the Connecticut River Power Company and the $9,000,000 in five-year notes of the North Boston Lighting Properties, constituted the largest of the month's offerings for any one group.

Bonds Lower; Stock Trading Light



Losses in public utility bond prices in October were sufficient to carry the "Electrical World" index down 1.2 points, from 93.2 in September to 92.0. The stock index advanced slightly during the past week to 28.3, as compared with 28.0 the preceding week.

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Name of Company	Amount of Issue	Period (Years)	Class	Purpose	Interest Rate	Price	Per Cent Yield
Connecticut River Power Co.	$18,000,000	20	First mortgage gold bonds, series A, sinking fund	To reduce indebtedness to holding company	5	94	5.50
Detroit Edison Co.	15,000,000	20	General and refunding mortgage gold bonds, series E	Improvements, additions and extensions	5	99½	5.04
Eastern Utilities Associates	6,000,000	3	Gold notes	Retirement of debt and other corporate purposes	5	98⅝	5.50
North Boston Lighting Properties	9,000,000	5	Secured gold notes	To retire maturing obligations and other corporate purposes	5½	100	5.50
Rockland Light & Power Co.	1,200,000	26	First refunding mortgage gold bonds, series A	To reduce bank loans for extensions and improvements	4½	93½	4.95
Sierra Pacific Power Co.	800,000	25	First mortgage and refunding gold bonds series B	To retire floating debt	5½	90	6.30
Union Electric Light & Power Co. (Mo.)	7,500,000	25	General mortgage gold bonds	To reduce unfunded debt	5	99½	5.04
Western Massachusetts Companies	2,500,000	5	Gold notes	To retire bank loans	5	99¼	5.06
Total	$60,000,000						

Further Rise in Weekly Output

Another increase, though smaller than the one before, is indicated in the 1,533,028,000 kw.-hr. output of electric light and power companies during the week ended October 29, as announced by the National Electric Light Association. The deficiency compared with 1931 is again 7.2 per cent, the same as in the preceding week, when the approach to last year's operations was the closest since the middle of February. Except as interrupted by Labor Day the change was the eleventh consecutive weekly increase.

Output in all geographical regions was less than in 1931 but the deficiency on the Pacific Coast was appreciably diminished and a further slight relative gain appears in the Central industrial area. On the Atlantic seaboard some ground was lost but in New England alone, despite a moderate set-back from 1931, output is close to 1930 figures.

Weekly Output, Millions of Kw.-Hr.

Week Ended	1932	1931	1930	1929
October 29	1,533	1,652	1,741	1,816
October 22	1,528	1,647	1,747	1,824
October 15	1,508	1,656	1,729	1,799
October 8	1,506	1,653	1,724	1,806
October 1	1,499	1,646	1,711	1,819

Per Cent Change from 1931

Region	Week Ended Oct. 29	Oct. 22	Oct. 15
Atlantic Seaboard	—3.1	—1.2	— 4.7
New England alone	—2.7	+0.6	— 0.2
Central industrial	—9.2	—9.3	—11.3
Pacific Coast	—7.8	—9.8	— 9.4
United States	—7.2	—7.2	— 9.0

▼

Federal Power Commission Assumes Control in Oregon

Following the request of the Commissioner of Public Utilities of Oregon, Charles M. Thomas, the Federal Power Commission has announced its intention to exercise the jurisdiction conferred by the federal water-power act to regulate and control the amount and character of security issues of its licensee, the Portland General Electric Company of Oregon, "until such time as the state of Oregon shall have vested the power of such regulation and control in its Public Utility Commission or other authority." Although two other companies were involved in the original Oregon Commission investigation—the Pacific Northwest Public Service Company and the Portland Traction Company—(ELECTRICAL WORLD, October 8, page 485), the Federal Power Commission extended its jurisdiction only to the Portland General Electric, since this company is a licensee of the commission, while the two other companies are not licensees and are not subject to its jurisdiction.

In its order the commission directed the Portland General Electric Company to file forthwith a complete statement of the capital securities authorized and outstanding or contemplated, the detailed purpose of issue, together with financial statements since organization in July, 1930, charts and resolutions and such other information as may be necessary and proper for consideration by the commission in carrying out the purposes and intent of the order.

Franklin T. Griffith, president of the Pacific Northwest Public Service Company, recently stated that the misfortunes of owners of Central Public Service Corporation stock are merely a part of the general catastrophe that struck the values in corporations of every description throughout the country. Central Public Service controls the Pacific Northwest Public Service and Oregon residents invested millions of dollars in Central Public Service stock. Mr. Griffith denies charges of mismanagement or manipulation in relations of his company and the Chicago organization.

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Governor Roosevelt Orders Binghamton Rate Inquiry

Putting into practice the contention expressed by him recently at Portland, Ore., that public service commissions should take the initiative in protecting the public interest instead of performing merely judicial functions, Governor Roosevelt has ordered the New York Public Service Commission to begin an investigation of the fairness of electric and gas rates charged in the city of Binghamton. The city is served by the New York State Gas & Electric Corporation, a subsidiary of the Associated Gas & Electric Company.

The Governor's action followed a visit from a delegation from Binghamton headed by Mayor Miles M. Smith. "The city of Binghamton is not satisfied with existing rates," Governor Roosevelt said in announcing that he had directed Milo R. Maltbie, chairman of the Public Service Commission, to begin an investigation. "However, the city officials felt that the taxpayers should not be saddled with the $50,000 or $60,000 which a local investigation would cost in order to prepare for the presentation of the case . . . Mayor Smith informed me that the City Council . . . adopted a resolution urging that the Public Service Commission investigate the situation."

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New River Plant Authorized by Virginia Commission

Authority to construct, maintain and operate a twelve-million-dollar hydroelectric power plant on New River in Pulaski County, Virginia, has been granted by the Virginia State Corporation Commission to the Appalachian Electric Power Company. Despite the issuance of the state license, however, federal intervention may still prevent the construction of this development. The Federal Power Commission has refused to issue a "minor part" license for the project and has forbidden the company to proceed with the construction until a "major" license, providing for full federal regulation, may have been obtained. Legal action by which the power company has sought to free this project from federal regulation has been resting in the Virginia federal courts for some time (ELECTRICAL WORLD, July 16, 1932, page 66; July 30, 1932, page 131, and October 29, 1932, page 580).

A state license was sought by the company in order to strengthen its petition for a "minor part" license from the Federal Power Commission. In granting permission to construct and operate the plant the state commission ruled that work must begin in one year and the project must be completed within a period of three years. Among the restrictions laid down by the commission was the provision that the construction and operation of the dam should not interfere with the stream flow and that not less than 50,000,000 gal. of water must be discharged daily. The commission further ordered that the power company must make an annual report of cost and expenditures.

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Engineer Support of R.F.C. Projects Urged by W. S. Lee

Active aid of the engineering profession in expediting loans for self-liquidating construction projects has been urged by W. S. Lee, president of the American Engineering Council, vice-president of Duke Power Company and former president of the A.I.E.E. Thirty-seven engineers have been invited by the Reconstruction Finance Corporation to serve in advisory capacities in connection with applications for loans of this character and Mr. Lee's letter was addressed primarily to them.

"In response to a request from the Reconstruction Finance Corporation for suggestions as to ways whereby the work of the corporation relating to self-liquidating projects might be simplified and expedited the American Engineering Council recommended the use of engineers in strategic localities," Mr. Lee's letter says. "The corporation has responded by placing an engineer on the advisory committee of each of its local loan agencies.

"In making this recommendation we felt a competent engineer could be of assistance to the corporation and the public by:

"1. Informing the public as to the provisions of the relief act relating to self-liquidating projects and as to the decisions made by the corporation as to the character of projects it could finance, and related subjects.

"2. Discouraging applications being made for loans on projects which do not come under the act, or on projects which are unsound either from an engineering or financial point of view.

"3. Rendering every possible advice to those who contemplate making applications on worthy projects.

"4. Encouraging governmental officials to make applications for loans for worthy projects. We urge that you give special consideration to the smaller projects.

"We earnestly hope you will co-operate in this work in order that real meritorious self-liquidating projects which come under the act may be advanced to provide work for as many engineers and others as possible, and as soon as it reasonably can be done."

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Substandard Flexible Cords Attacked by Chicago Bureau

Elimination of substandard forms of flexible electrical cord is the first objective in a campaign recently instituted by C. K. Cregier, chief inspector of the Chicago Electrical Bureau. In this drive, to which five inspectors have been permanently assigned, visits were first made to more than 500 jobbers, electrical dealers, contractors, hardware stores, variety stores, drugstores and other retail outlets, to determine the interest of such outlets in the educational campaign contemplated and find out just what materials were offered. The city was then divided into six zones for more ready follow-up by the special inspectors.

The program was undertaken following legal opinion in Chicago that it was the duty of the Department of Gas and Electricity to educate the public to the dangers involved, either in the misuse of electricity or in the purchase of badly designed and frequently unmarked electrical appliances, devices or materials.

While substandard, unidentified flexible cord has been made the first and primary object of attack, it is planned gradually to expand the movement to cover all forms of substandard electrical materials. The eventual reinspection of all Chicago's wired buildings is foreseen as the result of this campaign.

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Air Conditioning Could Save Industry $60,000,000 a Year

"At present not more than one-fourth of the manufacturers and industries which could be benefited by air conditioning have availed themselves of the possible economies," Willis H. Carrier, chairman of the board of the Carrier Corporation, told the New York section of the American Institute of Electrical Engineers last week. "In general, air-conditioning installations where now in use may be conservatively expected to pay for themselves every two years. We may estimate the present value of industrial applications of air conditioning in this country at $30,000,000 and under normal conditions they are probably producing economies of at least $15,000,000. The balance sheet for industrial applications might show annual savings aggregating $60,000,000 instead of $15,000,000."

Mr. Carrier referred specifically to results achieved in one of the factories of the American Cigar Company where it was found that with complete humidity and temperature control an investment of $34,000 showed gross savings of $29,546, accounted for by tangible increases in production and reductions in rejected products, lost time and labor turn-over. The total fixed and operating costs in this case amounted to $6,174 for the year, leaving, according to Mr. Carrier, a net annual saving a year in but one department of $23,372.

That the tropics might become ready fields for healthful exploitation by dynamic temperature zone men and that mining operations, today close to the limit of economic development, might be further utilized were two of Mr. Carrier's glimpses of the future possibilities and value of the air-conditioning field. Air conditioning adds approximately 14 to 20 cents a square foot annually to the cost of owning and operating an office building.

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Major New Construction This Week

Bids asked until November 10 by the Metropolitan Water District, Los Angeles, Calif., for construction of about 45 miles of 66-kv. and 30 miles of 33-kv. transmission lines; also, for two 6,000-kva. and three 1,000-kva. substations.

Machine drives, heavy-duty motors, controls, regulators, panelboards, etc., to be installed in strip mill at Follansbee, W. Va., of Follansbee Brothers Company. A $300,000 project.

Motors, machine drives, regulators, conveyors, etc., required for inlaid linoleum plant of Paraffine Companies, Inc., Emeryville, Calif. Cost $100,000.

Until November 29, City Purchasing Agent, Los Angeles, Calif., asks bids for steam-generating unit, complete auxiliary equipment and 65,000-kw. electric generator for city power plant at Wilmington Harbor (Specifications 2932 and 2933).

Motor-driven pumping machinery, engine-driven electric generating unit, with complete accessory equipment; transformers, switchboard, controllers, switching apparatus and auxiliaries are asked for in bids closing November 15 by Board of Trustees, Wilmette, Ill., for municipal waterworks service.

New York Metal Prices

	Oct. 25, 1932 Cents per Pound	Nov. 1, 1932 Cents per Pound
Copper, electrolytic	5.75	5.38
Lead, Am. S. & R. price	3.00	3.00
Antimony	5.50	5.50
Nickel ingot	35.00	35.00
Zinc, spot	3.40	3.35
Tin, Straits	23.50	23.35
Aluminum, 99 per cent	23.30	23.30

Missouri E. L. & P. Yields in Sullivan

Although it holds a franchise at Sullivan, Mo., which does not expire until 1946, Missouri Electric Light & Power Company has dropped its petition for a permanent injunction to restrain the city from proceeding with its proposed municipal power plant. Some months ago the voters of Sullivan approved an $80,000 bond issue for the plant. It is reported that a recent house-to-house survey made by the city resulted in 2,500 of the prospective electric current customers signing up 99 per cent for municipal service.

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Rate Cut for Philadelphia?

Answering the complaint through a committee that the charges for small manufacturers' and retailers' use of electrical energy in Philadelphia was based more on capacities than upon the energy actually used, William H. Taylor, president of the Philadelphia Electric Company, told the committee this week that unless the forthcoming Congress increases the taxation of utility companies lower rates for this class of business are assured. New schedules have already been worked out for consideration, according to Mr. Taylor.

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Contractor Ordinance Fought

Test of the validity of the Oklahoma City, Okla., ordinance requiring that all electrical work be done through a contractor, thereby eliminating the independent journeyman from the picture, has been sought in a suit filed in the district court. Several arrests have been made in connection with the ordinance.

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100,000-Hp. Hydro for Nebraska?

Surveys have been completed for three potentially important hydro projects in Nebraska (ELECTRICAL WORLD, October 29, page 582), but according to Prof. C. E. Mickey of the University of Nebraska no power company has shown any interest in the possibilities of either a 15,000-hp. between Lincoln and Omaha, a 54,000-hp. near Columbus or a 35,000-hp. near Freemont. Professor Mickey intimates that a power district might be formed in eastern Nebraska.

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Macon Studies Municipal Plant Cost

That a decision may be made within four months as to the advisability of a municipal power system, Macon, Ga., has authorized the Burns & McDonnell Company of Kansas City to survey the situation. The report is to show whether better and less expensive service can be obtained through municipally controlled distribution or through a privately controlled system. It will include an inventory of the distribution system of the Georgia Power Company, which serves the city; the approximate cost of duplicating it and the amount of current used and prices paid by Macon consumers. City officials stated that if the report were favorable, efforts would be made to buy the distribution system of the Georgia Power Company.

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I have heard some amusing talk about discrimination against the small consumer in favor of the big industries. The people who make such talk imply that the companies overcharge the householder in order that they may undercharge the manufacturer. Why on earth should an electric company invest its money to serve an industry if it must collect the return on the investment from the domestic consumer? The facts are that the electric light and power company must take care of the little people and that it can do so more cheaply by selling its daylight capacity, not used for evening lighting, to industries which can avail themselves of it. Whatever profit it makes on that sale cuts down the return which would otherwise have to be collected from the evening consumer.

ALEX DOW,
President Detroit Edison Company

[Mr. Dow recently addressed the annual convention of the Michigan Municipal League and took the opportunity to refute one of the more common popular acceptances.]

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Radio Maps Aid Navigation

Great possibilities are predicted for a new radio facsimile equipment enabling the daily reception of weather maps at sea, as demonstrated in tests made on the last round trip of the SS. *President Harding* between New York and European ports through the co-operation of the U. S. Weather Bureau, Radio Corporation of America and the United States Lines. Radio Corporation engineers reported that in most instances the maps were received in complete detail. Aviation use is foreseen.

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Washing Machine Sales Increase

Shipments of household washing machines have been on the upgrade for three months, according to industry figures presented recently in Chicago by J. R. Bohnen, secretary of the American Washing Machine Manufacturers' Association. "September figures of 29 manufacturers representing 85 per cent of the country's production, as reported to Ernst & Ernst, certified public accountants, totaled 56,251 machines, a 12 per cent increase over August," said Secretary Bohnen. "October shipments are confidently expected to show a continuance of this improvement, which began in August with shipment of 50,364 units, a sharp advance over July.

Philippine Utilities Unite

Fifteen companies operating on the island of Luzon, P. I., have been consolidated with the Manila Electric Company, according to an announcement made by the Associated Gas & Electric Company, which controls the entire group. The merger has been approved by the Public Service Commission of Manila. The properties acquired serve 50 communities, including some important provincial areas in Luzon.

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Connecticut Merger Approved

Merger of the Central Connecticut Power & Light Company into the Connecticut Light & Power Company has been approved by the Connecticut Public Utilities Commission. Both companies are under the common ownership of the Connecticut Electric Service Company, which is affiliated with the United Gas Improvement Company. The avowed purpose of the merger is to effect economies in accounting and to strengthen the credit of the Central company.

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Kentucky Plant Restored

Revamping of the Lexington, Ky., power plant of the Kentucky Utilities Company is nearing completion, a new switchboard installation being well under way, as well as fire barriers. Considerable damage was suffered some months ago when oil from a circuit breaker started a fire which destroyed switchboards, control, equipment, etc. The plant is operated by the Lexington Utilities Company.

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British Electrical Securities

Dealers in stocks of electrical enterprises in Great Britain report a keen demand at rising prices. Many of the leading British issues are now selling at record high quotations. In general, the returns available range from 4 per cent on County of London, metropolitan, and Yorkshire Piwer, to 4.7 per cent on Lancashire Electric. These yields are quite low compared with those obtainable on most other industrial ordinary share investments in Britain.

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St. Louis Power Scheme Opposed

Following earlier protests (ELECTRICAL WORLD, September 10, page 327) and a recent public hearing at which opponents of the proposed $20,000,000, 175,000-hp. hydro power plant on the Mississippi River near Chain of Rocks Bridge, St. Louis, Mo., voiced their objections once more. Major W. A. Snow, United States District Engineer, will conduct an investigation of the scheme and report to the Federal Power Commission.

Raceway Wiring Economical in World's Fair Buildings

Costs said to be about one-eighth of those encountered where ordinary conduit construction is used have been realized in the wiring of the various buildings of the 1933 World's Fair in Chicago. The system used, while not previously adopted elsewhere, is said to be especially suitable for factories and other industrial structures. Greatly reduced needs for secondary wiring through the flexibility and low cost of primary arrangements is an important consideration.

This system utilizes metallic raceways for carrying the wiring and was developed by the electrical division of the exposition. Two types of sheet metal raceways are used. One is 5 x 5 in. The other is 2 x 1½ in. Both are installed in 10-ft. sections. The larger, or 5-in. type, raceway is used to carry the main feeder cables through a building. It takes the place of the steel pipe conduit hitherto employed. As many as sixteen No. 00 cables can be laid in a single raceway of this type. The various wires are separated by asbestos sheets. They are laid in the raceway instead of being pulled in.

Construction is extremely simple and the installation reduces labor time and cost. The raceway is supported by a bolt in the center so that the wires can be laid on both sides of it. One of the major factors of economy lies in the placing of the fuse boxes, which are fitted directly on the raceway at any convenient point. By spacing fuse boxes at frequent intervals the secondary wiring system can be reduced to less than 30 per cent of the amount otherwise required.

It is estimated that approximately 70,000 ft. of 5-in. raceways and about 150,000 ft. of 2 x 1½-in. types will be used in the wiring of the various buildings of the 1933 World's Fair.

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Valparaiso, Ind., Rate Protest

Reduced electric rates have been requested in a petition filed by the city of Valparaiso, Ind., with the Indiana Public Service Commission. The petition alleges the Indiana Public Service Company to be earning $48,000 a year in excess of a reasonable return on its electric property in that city. The petition asks that a reasonable flat charge be fixed for power delivered for use of the city and that only reasonable depreciation and operating expenses be allowed.

Telemetering Successful in 500-Mile Operations

That continuous and immediate indications of quantities measured at points as much as 500 miles from the originating source may be reliably obtained by telemetering is said to have been demonstrated in recent tests by the Builders Iron Foundry of Providence, R. I., in co-operation with the New England Telephone & Telegraph Company.

In these tests the indicating impulses have been sent over communication lines simultaneously with normal commercial service without in any way interfering with local or long-distance calls. That phone service is being maintained is said to interfere not at all with the efficiency of either communication or telemetering. In using regular communication lines it is possible to achieve full flexibility in routing calls so that possible storm damage or interruptions to lines need offer no hazard to the sustained long-distance indication of conditions at remote points.

A demonstration of telemetering over relatively short distances, using the Chronoflo meter of the Builders Iron Foundry, was made at the recent convention of the New England Waterworks Association.

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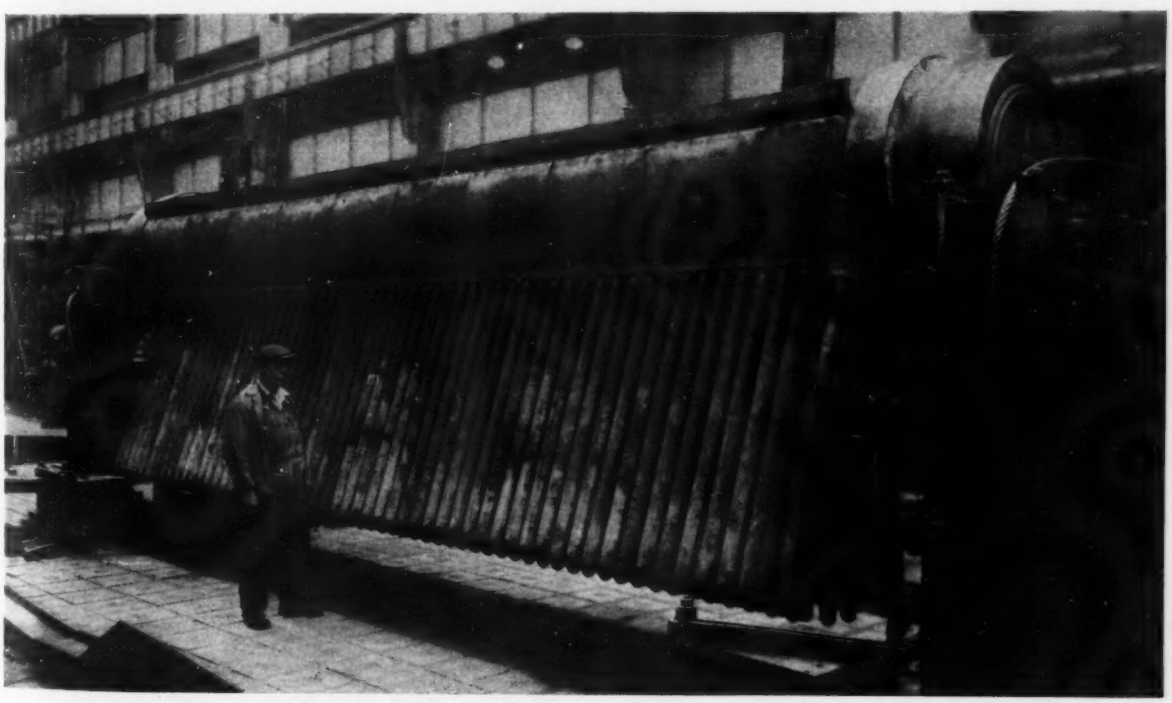
MERCURY BOILER FOR SCHENECTADY COMPLETED



This welded and X-ray-inspected boiler is one of seven to be installed in the two-purpose power plant of the General Electric Company at Schenectady to supply electrical energy to a utility company and steam and electricity to the manufacturer ("Electrical World," October 8, page 482). These "porcupine" drums are used in connection with the mercury part of the steam-mercury installation and are similar to those in the unit now under way at the Kearny station of Public Service Electric & Gas Company in New Jersey ("Electrical World," August 27, page 265).

EDITORIALS

L.W.W.MORROW
Editor

Hydro development reduces the national payroll

ONE of the schemes advanced in the recent political discussions for helping the national economy and restoring prosperity is the more intensive development of our remaining water-power facilities. Along this line it has been proposed to develop the St. Lawrence and after that the Columbia. Granting that what the country needs is an expansion of the purchasing power of its wage earners and not particularly any further expansion at present of its capital plant facilities —examined in this light, how will hydro development substantiate the claim that it will advance the national economy?

To begin with, it has been recognized for some time that hydro is by and large no longer competitive with steam-generated power and that it can be developed only by being subsidized in some form—directly or indirectly. But when this happens, when a hydro development is permitted that cannot stand on its own feet, the national economy is bound to suffer. Worse than this, the subsidy that brings this about definitely tends to reduce the national payroll. For, although it is well known to some, it is generally not fully appreciated that in a hydro-electric project the principal costs of the power are the fixed charges (paid to the bondholders generally), very little going into operating expenses in the form of labor and materials. In a steam-generating plant, on the contrary, fully 50 per cent of the total cost of power goes into continually recurring expenses for material, fuel being a large part of that, and labor. Yet in spite of that the total cost of power, which includes fixed charges and operating expenses, is less for the modern steam plant than for almost any hydro plant that has not already been developed.

For example, a typical very modern steam plant might have a production cost of $2.60 per thousand kilowatt-hours. The corresponding cost in a hydro-electric plant might be about $0.30. Thus for every billion kilowatt-hours generated each year by hydro there is less paid out directly for labor and material, the approximate sum of $2,300,000. This means $2,300,000 less to coal companies, railroads, lubricating oil manufacturers and to power plant operators. But this amount is obviously reflected in further reductions in purchasing power and payrolls, so that it is entirely possible that this process results in as much as a $10,000,000 to $15,000,000 annual decrease in the national payroll. If we take the maximum possible hydro that might be developed along these lines at 20,000,000,000 kilowatt-hours, it can be seen that this development would mean a reduction in the annual payroll of between $200,000,000 and $300,000,000. This most certainly is not a negligible item. It is to be noted, too, that all this will result in more expensive power, so that the only beneficiaries of the developments along those lines are those who are provided with additional means and outlets for investment of their capital.

Start a "Buy-American" movement now

AMERICA is fighting to preserve its domestic business and preserve the superior standard of living. Tariff does its share, but an adequate tariff appears preposterous in many cases. For example, the Japanese will have sold some eighty or ninety million large and miniature incandescent lamps in this country before the year is out. Those lamps are produced by skilled and unskilled labor that draws a wage of less than one-

fifth the wages of the American workers. What if the American people did save even as much as $1,900,000 by avoiding the higher price for the higher quality American product! They lost far more—it is estimated at $11,000,000—in the greater consumption of energy for the less efficient and cheaper imported product. Worse than that, they deprived some 1,600 persons from earning nearly two and a quarter million dollars in wages, adding that much to unemployment and distress and subtracting that much from the volume of spending capacity. Christmas tree lamps are being sold at one-sixth the American manufacturers' prices. Russia is being tempted to imitate Japan's success at our expense.

With a prospect of readjusted tariffs, whatever the outcome of the impending election, American business will do well to survey the pros and cons of a national movement to preserve the American market for American goods and the American wage for the American workman. "Buy American" is a good slogan to prevent foreign underselling, which will cause a recurrence of the disposition to lose faith in our economic security and again be tempted to "sell America short." Add to this protection against depreciated currencies.

Rent Appliances and Power Equipment

IN EUROPE is found a growing tendency to rent domestic electric appliances and electrical power equipment for industrial plants. Very satisfactory results have been had and now several utilities in this country are trying out the rental plan for heavy-duty domestic appliances.

Many aspects of the present business situation warrant a thorough study of the rental principle of selling. Installment buying of heavy-duty domestic appliances has stopped chiefly because prospective customers refuse to commit themselves to future obligations—they feel certain only of their current income. Another element is the growing number of families that live in rented homes who do not wish to own outright water heaters, ranges, oil burners and air-conditioning equipment that is more or less built-in and permanent. A still further element is that family savings have been lost or reduced and initial capital outlays for major purchases will not be made. Thus the domestic market is very receptive to a monthly rental plan that will overcome these primary sales resistances.

CONDITIONS in the industrial market are different, and yet they favor the rental of power equipment in many instances instead of its outright sale. New capital expenditures by industrials for equipment is now based upon paying for the equipment within approximately one year from the savings the equipment makes. This involves a very high rate of capital write-off and thus makes new equipment sales possible only in a relatively few instances. Another aspect is the growth of small industrial plants in local market areas. Their ability to buy outright is limited and they do not desire to put their money into factory equipment. Many industrial plants, therefore, would look favorably upon a rental plan both from the point of view of conserving capital investments and because of the economic gains they could make by changing their present practices and equipments without requiring the extraordinarily high rate of capital write-off on new purchases that now prevails.

FROM a sales point of view, therefore, rental plans are very promising. From an internal industry organization point of view, however, many changes in policies and practices would be required to institute the plans. All sales outlets must be able to participate and a rental commission must replace the usual discounts to sales agencies. The second-hand values and markets must be investigated. Credit and financing must be adequate and possibly both regional and national corporations would be required to get and handle the capital and credit involved. But present organizations for financing installment paper, the advent of trade acceptance paper, the present long terms for installment buying—all these are embryonic organizations that could develop into business enterprises for making rental plans a success. We believe the market and sales possibilities of electrical equipment rentals are so great at the present time that the industry can well afford to measure them and act at once to get this business.

Photo-Cells in Industry

"NEWSPAPER plants of the future may be marvels of automatic production, with every mechanical job now intervening between writing of a news story or editorial and the actual run of the papers on the presses performed by the electron tube or 'electric eye.' Recent scientific developments of the ubiquitous electron will soon make unnecessary the linotype operator, the compositor and the engraver." So prophesied O. H. Caldwell, editor of *Electronics*, before the New York Electrical Society October 19, when five other speakers discussed existing and possible applications of the "electric eye" and electron tube in the printing, engraving and associated industries.

Among present applications of the electric eye, cited by Mr. Caldwell, are:

1. Automatic machine setting of type from typewritten copy.
2. Halftones made by photo-electric scanning, without acids.
3. Automatic control of accurate register on web presses.
4. Automatic control of accurate trimming.
5. Automatic stops for presses, in case of paper breaks.
6. Counting logs in paper mills, sheets and forms in binderies.
7. Matching colors of inks and papers.
8. Measuring glare and opacity of paper.
9. Detecting and correcting press vibrations.
10. Safety-first devices around presses, rolls, etc.
11. Automatic door openers and shipping aids.
12. Circulation analyzers.
13. Office conveniences.
14. Automatic mailing sorters.
15. Counting press runs.

While discussing application No. 2—halftones from photo-electric scanning—Mr. Caldwell exhibited examples of halftone engravings made with the assistance of the electric eye in a fraction of the time necessary with the present acid processes. "By the new method, an average office employee without training can make a halftone in five minutes," he declared. Such an electrical process also enables cuts to be made simultaneously in a group of cities from a single photographic print.

By application No. 14, which involves a dot code, the electric eye permits classifying copies of a publication by state, city, street and number and properly routing them to the subscribers by mail automatically, without any clerk seeing the addresses. This application is under consideration.

Inventors in the United States, as well as foreign countries, are developing "talking books" which will read the day's news aloud, interspersing editorials and news stories with musical numbers, Mr. Caldwell pointed out.

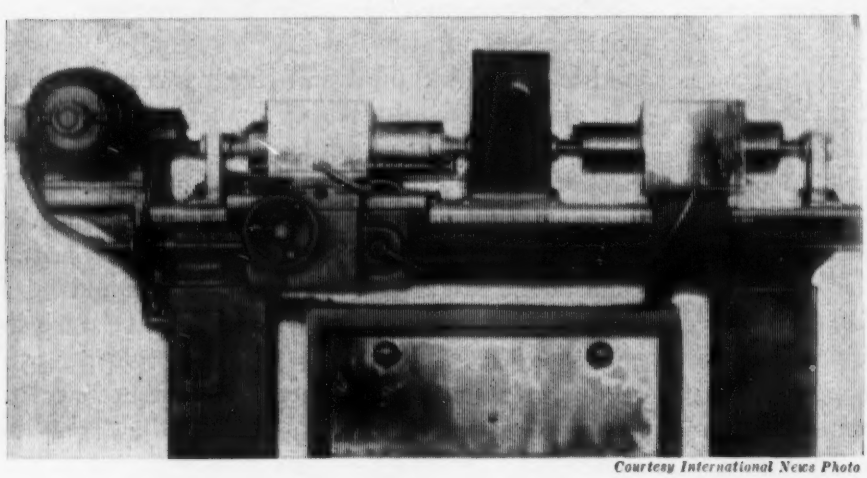
Among the paper, pulp and printing industries 30 per cent show by their requests an interest in measuring opacity or transparency of paper, 20 per cent in measuring illumination, 16 per cent in alarms indicating paper "breaks," 15 per cent in cutting paper at a printed mark, 14 per cent in counting objects such as sheets, cartons, logs, etc., and 5 per cent in measuring color of pulp or paper. According to Anthony Lamb, Weston Electrical Instrument Company, "photronic cell" methods of solving some of these problems have been worked out either by his company or by the individuals interested.

The New York *Daily News* uses an opacity meter,* embodying the "photronic cell," a microammeter and a 100-watt bulb, to detect before papers are printed whether the ink will show through and disturb the reader. Already more than 500 samples have been so classified.

The McGraw-Hill Publishing Company uses a photronic cell, relay and electrical counter to count printed matter handled on folding machines.

By placing a photronic cell on one side of a paper machine or printing press and a light source on the other side a break in the paper can be made to sound an alarm, operate a signal or even stop the machine. Counting can be accomplished with similar equipment, as a punched or transparent spot passes between the light and cell. In one installation, where the paper travels 600 ft. per minute and the counting hole is $\frac{1}{2}$ in. in diameter, about 200 passages of the hole are recorded per minute. By the use of a proper light source the counting relay can be used for counting opaque objects, declared Mr. Lamb.

In the Holland Tunnel entrance of truck loads extending more than 12½ ft. above the tunnel floor is prevented by their interception of a light directed on a photronic cell, which in turn sounds a warning when the truck driver halts to pay the entrance fee. In the same



Courtesy International News Photo

Photo-cell engraving machine makes cuts without acid etching

The photograph to be reproduced and the metal to be engraved are mounted on separate drums on the same shaft. The portion of the photo scanned by the electric eye is illuminated by the two converging projectors and amplified electrical currents from the photo-cell, proportional to the light or shade, determine the depth of cut made by the engraving tool. This engraving was made by this process in about two minutes.

*See September, 1932, "Printing Equipment Engineer."

tunnel is another application of the photronic cell to warn of smoke in the air. A light beam is projected approximately 120 ft. diagonally across the upper part of the tunnel onto a light-sensitive cell. The slightest haze sounds an alarm and indicates the "per cent smoke" at the room, ¼ mile away, where reserve fans are controlled. Both of these tunnel applications have been in service six months without a single failure, Mr. Lamb reported.

This type of smoke indicator is helping some large New York stores and factories to avoid trouble with the Smoke Abatement Committee, the Reid Ice Cream Company

Overheight vehicles approaching Holland Tunnel detected by photo-cell

A light projector and "photronic" cell mounted on top of these toll booths signal to toll collector if vehicle is too high to enter tunnel so admittance is delayed until the load can be rearranged. Thus equipment supplants the mechanical contrivances spanning the lane and formerly used unsuccessfully for the same purpose.

Courtesy Weston Electrical Instrument Company

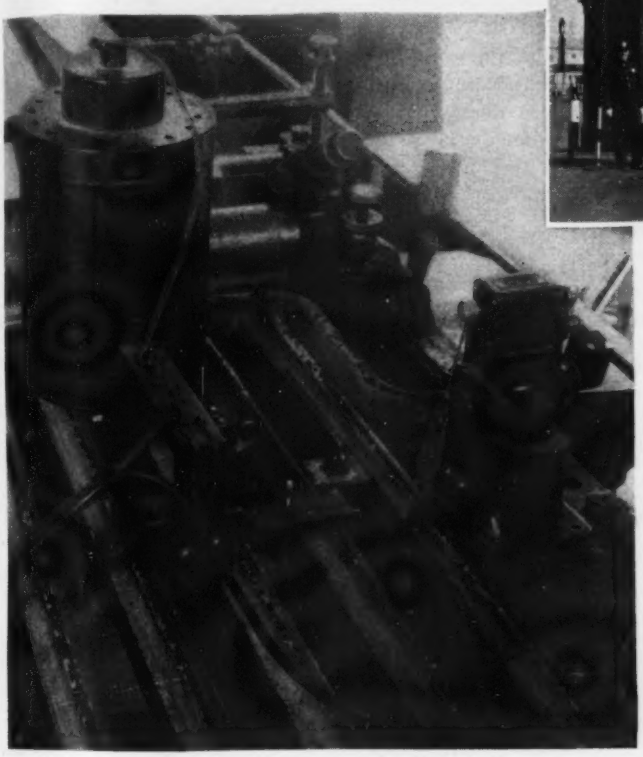


Photo-cell applied to folding machine

"Electric eye" is mounted on support projecting down between grating, and through relay actuates counter at right.

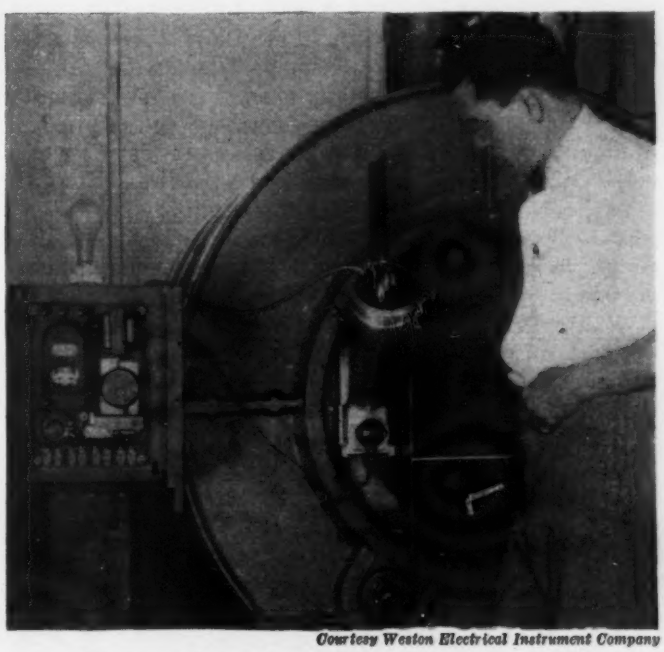
recording the time whenever the smoke density from its stack exceeds an allowable amount.

The McCormick Roaster Company, York, Pa., is using photronic cells and relays to light a signal when the coffee in its roasters attains the color corresponding to the desired degree of roasting.

Illumination of the emergency landing field at Bowie Field, Md., and of the model airway exhibit in the U. S. Department of Commerce building have been controlled by photronic relays for eight months. Similar apparatus is used to turn on automobile parking lamps at dusk and to measure variations in illumination from the sun.

Tone and three-color engravings can be made without the delay of the usual acid-etching process, Walter Howey, director of International News Photos, demonstrated. The photograph to be reproduced is mounted on one cylinder of a machine that looks like a lathe and revolved in front of an "electric eye." The faint electrical impulses sent out by this electric eye, averaging a ten-millionth of a watt, are amplified up to a third of a horsepower, to operate an engraving tool which cuts into a metal plate, areas of light and dark, corresponding to the light and dark elements of the picture. By reversing a switch negatives can be directly obtained, or intaglio cuts made directly for offset work. Engravings made by this process during a month's operation of the Syracuse (N. Y.) *Journal* averaged a cost of three-quarters of a cent per square inch, it was reported.

The tone engravings can be made at an average rate



Courtesy Weston Electrical Instrument Company

Degree of roasting indicated by photo-cell

When the color of the coffee, which is a measure of the degree of roasting, attains a predetermined value a "photronic" cell operates a warning signal.

of ten square inches per minute; those showing fine details a little slower.

The three-color process shown by the speaker makes its own color separation, the electric eye at each scanning separating out the particular color desired with far greater fidelity than possible with photographic processes. Three-color plates can be turned out in two hours that would otherwise take two days. A liquid color filter removes the infra-red and heat from the rays of a 1,000-watt airplane beacon used for enlarging and printing, with a speed 200 times that heretofore employed. This process is now saving $1,000 weekly in the International News Photos laboratories, according to Mr. Howey.

Some of the many applications of the photo-cell for mechanical control in printing and paper-making plants were described by John B. Bassett, General Electric Company. One is the automatic press-stop which "sees" an impending break in the great roll of paper being fed to a press and instantly operates to stop the machinery, minimizing the loss and pressroom disorder resulting from such a break. Another is the "flying paster" which makes it possible to put on a new roll of paper when the roll ahead runs out, without stopping the press. Other electric-eye applications include the automatic setting of type from code characters on the reporter's typewritten copy, inserted by a special typewriter face; safety stops and safety devices on feed-rolls, bindery and shipping-room door openers and illumination control.

A device new to the printing industry, the colorscope, was shown by H. H. Sheldon, Sheldon Electric Corporation. It tells whether two color samples are alike or different, in which way these samples differ, amount of this difference, and what colors have to be added to make them similar. The colors to be compared are placed in a revolving head before two photo-electric cells which form two branches of a balanced circuit. Intensity differences of the samples are registered on an electric meter. The color differences are later determined by the same apparatus using primary color filters. A calibrated iris diaphragm allows the differences to be expressed in per cent of total light, whether the samples be white, black or any color or shade. By rapid rotation of the samples and because the color is seen entirely by indirectly reflected light, the confusing effects of weave and surface glare of textiles and other materials are eliminated. The color of light transmitting dyes, etc., can also be compared. The device is wholly independent of any judgment on the part of the operator and is about as simple to operate as the modern radio.

A stroboscopic lamp, which permits studying fast moving parts in motion, was displayed by the General Radio Co. It will permit seeing moving parts in detail which hold their approximate position at least 5 ÷ 1,000,000 seconds, it was reported. One practical application is checking color register on presses while in motion.

Photo-electric equipment for comparing similarly colored liquids or opaque materials was described by E. B. Lyford, American Photoelectric Corporation. The first device—a "color comparator"—was reported to measure within an accuracy of 1/20 of 1 per cent, or about 40 times more accurately than the human eye. The latter device—a reflection meter—was reported to detect differences in depth of similar colors as small as $\frac{1}{10}$ of 1 per cent, or about 20 times more accurately than the eye.

The "comparator" measures the relative total light transmission over the visible range, when similarly colored liquids are placed in standard glass cell containers. Two identical liquids will exhibit the same total transmission and will read the same on the instrument, it is reported, but two similar liquids differing somewhat in their depth of color will exhibit different total transmission. This instrument may be used by the paper and printing industries, it was pointed out, for the comparison, in appropriate dilution, of the dyes which are used, and by a slight adaptation for the rapid measurement of turbidities, for sulphate determinations and for the determination of the amount of sediment in the water supply.

The reflection meter is designed for the color comparison of manufactured paper, color of inks when printed on various papers, etc. It operates in a manner similar to the "comparator," but on the total reflected light over the visible range. This instrument may be used by the paper industry for the comparison of the clay fillers used in the manufacture of glossy paper, for comparisons and production checking of the finished product and for the determination of the opacity and "hiding power" of the finished product.

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Electric Welding Repairs Waterwheel Runners

By M. O. McKINNEY

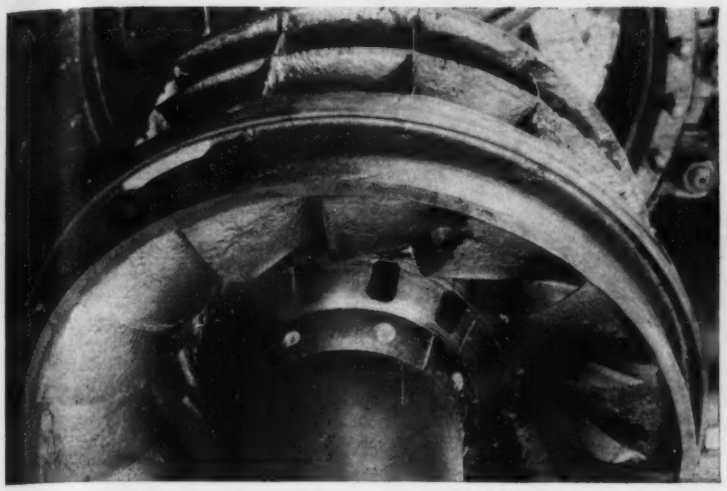
Chattanooga Office, General Electric Company

It is common for the runners of waterwheels in use in hydro-electric plants to wear due to erosion and pitting. This is especially true of cast-iron and steel wheels of modern high-efficiency types. Corrosion or rust is seldom a large factor. In plants where the water carries appreciable amounts of sand in suspension, erosion takes place by constant wearing of the sand particles on the metal. Pitting occurs on runners operating under a high-vacuum draft and is the most common form of wear in the hydro plants of the Tennessee Electric Power Company.

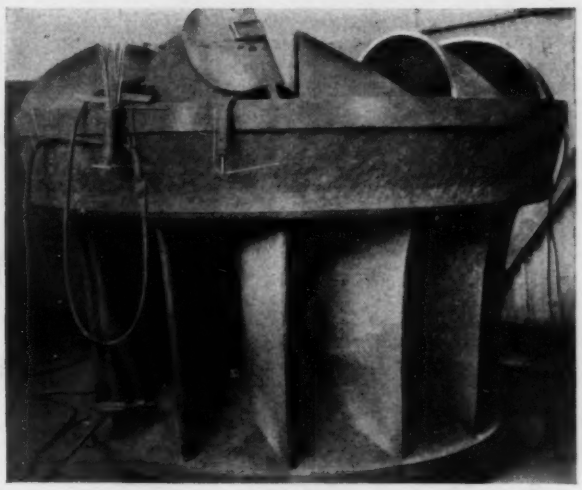
Practically all of this pitting occurs on the back side of the buckets, in patches on the side of the buckets nearest to the draft tube. It is known that pitting occurs where the main stream of water, usually traveling at high velocity, is pulled away from the buckets by the draft vacuum. Evidently the combination of the power of water at high velocity and the vacuum, possibly alternating over the metal surface, causes this pitting, faintly at first, but gradually eating into the metal much as a tooth decays, until the pits cause a spongy appearance.

All hydro-electric power companies have the problem of replacing or salvaging the runners of their water turbines. In recent years electric welding has been called upon to solve the problem. With the usual cast-iron wheel there is the problem of welding dissimilar metals—high carbon steel to cast iron.

The Tennessee Electric Power Company successfully repaired its first cast-iron runner in 1927. The method employed in this and similar instances is as follows:



Erosion and pitting of buckets of cast-iron runner on discharge side
Approximately 33 per cent of metal on buckets and ring is worn away before it is removed for reconditioning.



Cast-iron wheel in process of repair
Note electrode bent in holder to work in limited space.

The pitted areas are cleaned out by chipping, thus obtaining a solid surface on which to start the welding. The buckets are then drilled and tapped for ½-in. steel studs spaced about 3 in. on centers. This assures a good bond between the cast iron and the metal deposited by the welder. For drilling and tapping a special machine was developed to work in close places. It was made of automobile steering parts. As a base on the cast iron, and for filling, a G.E. type A rod is used and this is covered with a layer of type I rod to give a surface of wear-resisting high-carbon steel. After the welding is completed rough spots are removed by grinding. This gives the repaired runners greater life than the original all-cast-iron runner.

After this company's success with the cast-iron runners it was easy to repair fabricated steel runners because of the ease of depositing electrically welded metal on steel.

A typical example is a wheel from one of the Tennessee Electric Power Company's plants. Before the repairs approximately one-third of the bucket and ring surface was worn away. The wheel is from a 15,000-hp. double-discharge horizontal turbine running at 360 r.p.m. with a 210-ft. head. The wheel itself is approximately 54 in. in diameter and 36 in. wide. On this steel wheel a type L electrode was used as a base and filler with type I electrode used on the surface. A total of 1,300 lb. of welding rod was used in this repair work. An excellent welding job has been done on these runners, although it was very difficult on account of the limited space between vanes.

The welding was done by a type WD 23-300-amp. arc-welding set which was purchased for maintenance and general repair work.

Since 1927 it has been common practice to repair water turbine runners by electric welding. The majority of the wheels operated in the five large plants of the above-mentioned company have been repaired by this method at a very great saving compared with the cost of purchasing new runners.

Carlisle on Regulation

OUR corporations are creatures of the state government which has all the powers that can be possessed under our Constitutions to regulate our business.

There are some people in this country who believe that the federal government can better regulate the industry than the states. . . . If the New York City electric companies were regulated from Washington, with little knowledge of local conditions and perhaps little sympathies for our peculiar problems, great and incalculable damage could be done to the economic life of this city.

Sane and reasonable regulation by the state is preferable to making rates with municipalities by contract, which is really what preceded our present system. Our greatest danger, I believe, is over-regulation. Thomas A. Edison voiced it when he said five years ago: "Great days are ahead of this nation and the world, and electricity will have a great part to play, granted only that it can be unfettered, with full opportunity for the largest possible individual initiative and energy."

The danger in over-regulation is the substitution of the business judgment of commissioners for the business judgment of boards of directors and management. Government regulation insures no certain business or revenue. It is a matter, primarily, of protecting the public from unfair and discriminatory rates. Companies must produce their service at costs that will permit its sale at a profit, or the enterprise fails. . . .

The electric companies can only hold their business because they can generate, distribute and sell their product cheaper than can the individual person or corporation. Management must primarily rely upon sound economics for its earnings, rather than upon government assistanee.

There are many honest and well-meaning people who say that government regulation of this industry has failed in practice. . . . One of the late suggestions is government competition. . . . The effect of such government competition would be to utterly destroy the established public utilities and substitute therefor government undertakings requiring enormous capital investment, duplicating that already in existence, and committed to rate schedules below the cost of production.

In my judgment, if the government cannot successfully regulate this industry, it cannot successfully own and operate it.

FLOYD L. CARLISLE,
Chairman boards, Consolidated Gas, N. Y. Edison and Niagara-Hudson Power Corporation.

Year of Experience Solves Primary Network Problems

By R. J. SALSBURY* and H. S. MOORE†

A YEAR of operation of the Pittsburgh primary network and the results of extensive tests have verified the soundness of its principles and the value of its application to areas of medium load density. In technical operation the primary network in Pittsburgh has demonstrated that:

1. The application of inverse reactance compensation to the voltage regulators will eliminate the problems of instability, circulating currents and unnecessary transformer breaker lockouts.

2. By making the regulators non-automatic when the transmission supply is interrupted the network relays will operate properly on transformer exciting current.

3. By the application of a phase shifter which gives an equivalent in-phase connection the network relay will provide complete protection at all times in the case of faults at the secondary terminals of the transformer.

Safety and reliability enhanced

Most important of all, the network has demonstrated to the operating man that it provides marked improvements in both safety and reliability of operation, conditions which result largely from its simplicity and which have been proved in practice.

With no live buses to be de-energized and cleaned, with no exposed live conductors in any of the units and with provision for the complete isolation of a unit for maintenance, the ultimate in safety from the point of view of electrical hazards is practically achieved. For example, with the type of design which the network permits it is possible to allow persons entirely unfamiliar with the dangers of live electrical equipment to maintain the yard at the Oakmont station. This can be done because it would require the application of a large amount of deliberate force to make contact with any energized conductor.

With respect to reliability, all that need be said is that since the network was placed in operation there has not been a single interruption to service other than that due to secondary trouble on the customers' premises. This is true notwithstanding the fact that the network was in operation through the better part of the 1931 lightning season, which in the Pittsburgh district was particularly severe. The network has thus demonstrated in practice that one of its principal advantages is reliability, for, in the words of a 35-year veteran who is in charge of its operation, "It would take *some* catastrophe to shut off the lights in that town."

This has not been achieved, however, without intensive study of the behavior, under operating and test conditions, of the various elements of the system.

The area had been served by a single-phase and three-phase, 2,300-volt radial system. The Hulton and Oakmont transformer units of the primary network were completed‡ early in March, 1931, but did not carry load until April 15, 1931. During this period the units were energized and paralleled by two tie mains.

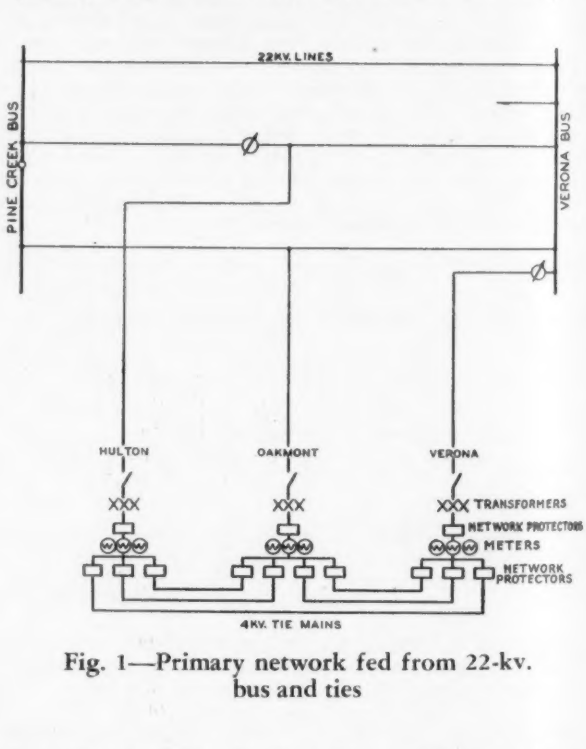


Fig. 1—Primary network fed from 22-kv. bus and ties

The entire load was cut over to the two completed tie mains and one other main which operated radially for a short time. The Verona transformer unit was installed on the concrete pad which formerly held the transformers for the radial system and was cut into service June 1, 1931, thus forming the completed network with all tie mains carrying their designated loads.

A schematic sketch of the mains and transformer units with their taps to existing transmission feeders is shown in Fig. 1. Since the original cut-in, there have been fifteen transmission feeder operations affecting the network transmission feeders and in all cases the relays have functioned properly. During one storm two of the three transmission feeders were out of service for a

*Superintendent of operation substation department, Duquesne Light Company, and †senior engineer Byllesby Engineering & Management Corporation, Pittsburgh.

‡*See A.I.E.E. paper, March 11, 1931, by Messrs. R. M. Stanley and C. T. Sinclair, abstracted in "Electrical World," March 14, 1931, page 496. Also see "Construction of Pittsburgh Primary Network," Electrical World" September 3, 1932, page 304.*

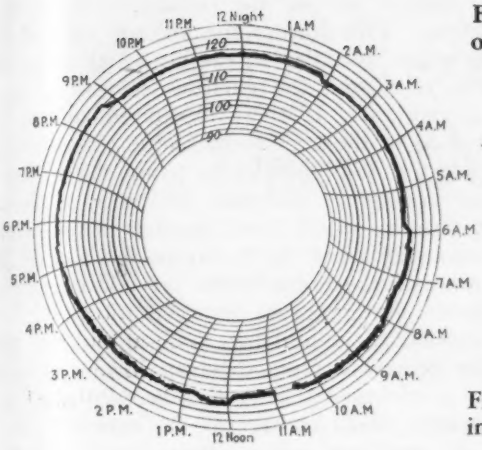


Fig. 2—Voltage at steel plant off 22-kv. feeder

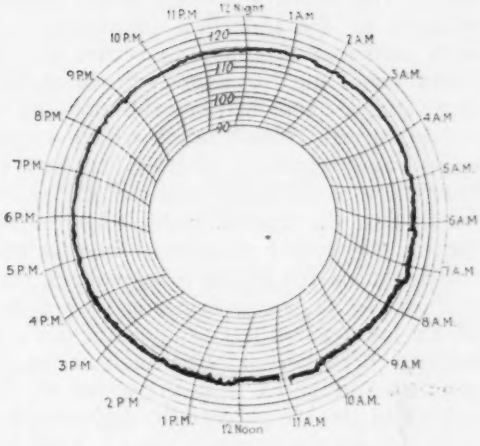
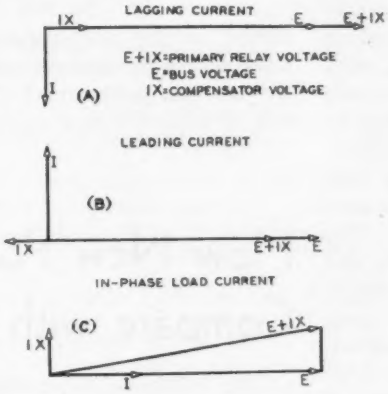


Fig. 3—Close voltage regulation on network tie mains

Fig. 4—Compensation involves inverted reactance drop



short time and the remaining unit carried the entire load without an interruption to any of the network load. From the time the first units were placed in service to the present there have been no outages to any of the tie mains. Since the tests and adjustments to be described were completed on August 1, 1931, no operating difficulties have been eperienced with the network.

During the transition period there were voltage fluctuations on the long radial main, due to an overloaded condition and to the operation of a 300-hp. compressor motor being supplied over nearly 2 miles of No. 1/0 main. Since the completion of the network this motor has not caused any fluctuations in the voltage even when the adjacent unit is out of service.

Typical voltage conditions on the network are shown in Figs. 2 and 3. The transmission feeder voltage is subject to considerable variation due to the industrial loads it serves. The regulators and inherent network regulation, however, compensate for this condition and supply the network mains with a uniform voltage.

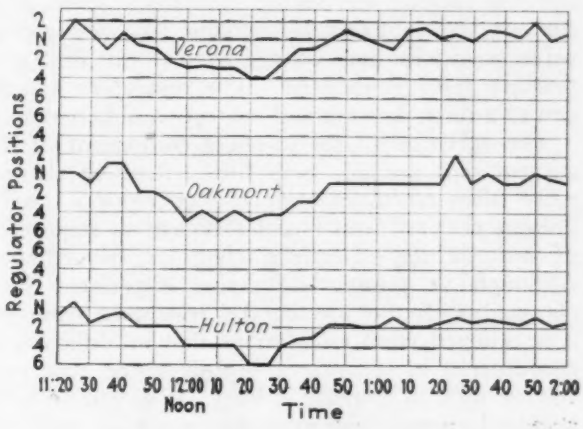


Fig. 5—Voltage regulators in end brought into step

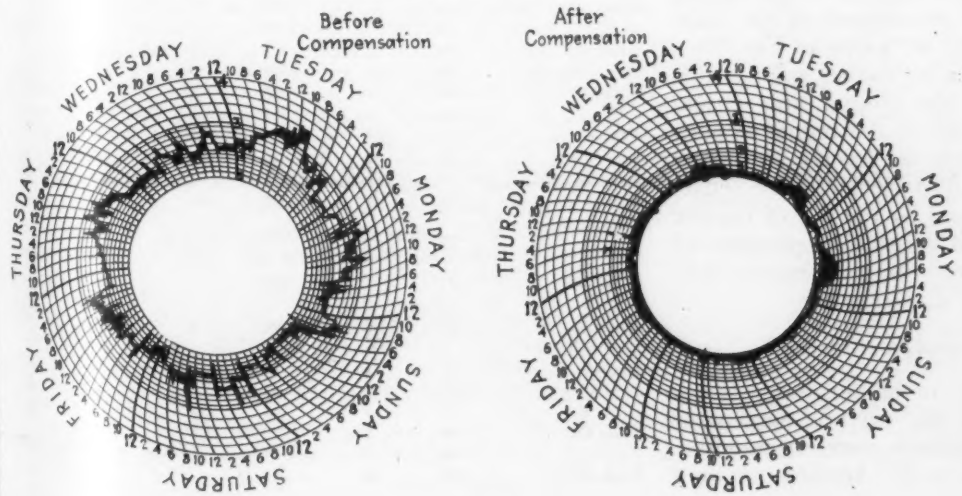
After placing the network in service several problems were introduced which are not encountered in low-voltage networks:

1. The induction regulators at the three units took up widely varying positions, causing comparatively heavy circulating current between the units, and it was found that the settings of the regulators' voltage relays could not be made with sufficient accuracy to correct this condition. Furthermore, during light load periods the network relay at the Hulton unit would operate and cause frequent unnecessary lockouts of the transformer breakers.

2. Trouble was experienced in securing reliable operation of the network relay on the exciting current of the transformer.

3. Preliminary ground fault tests revealed certain limitations in the operation of the network relay as a means of clearing faults. For instance, the standard relay scheme would not clear a solid ground fault on the low-tension side of the unit transformer.

Fig. 6—Circulating current greatly reduced by compensation



At each network junction induction regulators are provided to compensate for change in transmission line voltage and to correct for the drop in voltage due to

load. The primary voltage relays which controlled the position of the induction regulators could not be set with sufficient accuracy to secure satisfactory parallel operation of the regulators without an undue amount of circulating current between the units. However, by providing current compensation which was especially sensitive to any flow of wattless current it was possible practically to eliminate this circulating current. It was found that the desired result could be obtained by cutting in the proper amount of inverse reactance current compensation for the primary voltage relay. The effect is shown in the vector diagrams of Fig. 4. If the voltage of the low-tension bus at any unit is too high a wattless lagging current is supplied to the network and the compensator voltage IX is added vectorially to the secondary voltage of the bus potential transformer to give a voltage $E + IX$ on the primary relay. This tends to run the regulators to a lower voltage position, which corrects for the lagging circulating currents. With a leading current the compensator voltage IX is negative with reference to the bus voltage so that the voltage on the primary relay is reduced. The regulators will then be run to a raise position and correction obtained as before.

The variation of the in-phase component of the load current will produce very little effect on the primary relay when reactance compensation alone is used. The present network load is not sufficient to require the use of any of the resistance steps of the compensator. Although at present no actual experience has been obtained with the use of the resistance compensation, it is believed from calculations that no difficulty will be encountered in securing a slightly rising junction point voltage with an increase in load. It should be noted that standard current compensators cannot be used and that to secure the desired effect the reactance element of the compensator must be reversed internally.

Regulators now synchronize their action

During the period since the current compensation has been in service observations have been made on the variation in the induction regulator positions during changes in the network load and the high-tension transmission voltage. The curves in Fig. 5 were plotted to show how the regulators at the different units move together to maintain a constant voltage at the network junctions. Two sets of graphic ammeter charts taken before and after the current compensation was cut in show clearly the extent of the reduction in circulating current. The effect was most pronounced at the Oakmont unit. Two of these charts are given in Fig. 6.

Before stable operation of the regulators was secured frequent lockouts occurred at the Hulton unit during light-load periods. The variations in the regulator positions at such times were sufficient to reverse the power flow and cause the network relay to operate. The reduction in circulating current affected by the use of current compensation not only resulted in stable operation of the regulators, but also eliminated the unnecessary lockouts of the transformer breaker in idle periods.

Operation on exciting current controlled

When an attempt was made to adjust the network relay for sensitive operation on the exciting current of the unit transformer other difficulties were encountered. The opening of the high-tension line feeding the unit drops the bus voltage so that the regulators go to the full-raise position. This lowers the voltage applied to the unit transformer and also to the potential elements of the network relay and the exciting current of the transformer is reduced. If there is any unbalance in the voltage applied to the transformer, due either to an unbalanced loading of the network or to the three regulators stopping in slightly different positions, a circulating current is set up which flows through the network relay. The combined effect is to reduce the torque of the network relay to the point where reliable operation is not obtained. To improve this condition, it was arranged to make the regulators non-automatic the instant the flow of power from the transformer toward the network was reversed. This was accomplished by using the normally closed contact of the network relay to drop out an auxiliary relay which would cut the regulators out. By this means normal voltage is maintained on the transformer and the network relay and satisfactory operation assured.

The lessons learned from staged short-circuit tests will be reported in a subsequent article.

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How New Pole Classes Compare with Old

The following table shows the relationship of the old lettered Western red cedar pole classes to the new A.S.A. numbered classes. (See ELECTRICAL WORLD, February 27, 1932, page 390.) The equivalent of classes AA, A, B, C, D are given in terms of classes 1 to 7.

	—Length 30 Ft.—		—Length 35 Ft.—		—Length 40 Ft.—	
	Per Cent	Class	Per Cent	Class	Per Cent	Class
Class AA	66	1	75	1	50	1
	34	2	25	2	50	2
Class A	50	2	66	2	75	2
	50	3	34	3	25	3
Class B	50	3	50	3	50	3
	50	4	50	4	50	4
Class C	25	4	13	4	13	4
	63	5	75	5	75	5
	12	6	12	6	12	6
Class D	75	6	75	6	100	6
	25	7	25	7	...	...

	—Length 45 Ft.—		—Length 50 Ft.—		—Length 55 Ft.—	
	Per Cent	Class	Per Cent	Class	Per Cent	Class
Class AA	25	1	25	1	75	1
	75	2	75	2	25	2
Class A	75	2	75	2	84	2
	25	3	25	3	16	3
Class B	50	3	50	3	60	3
	50	4	50	4	40	4
Class C	13	4	25	4	38	4
	75	5	75	5	62	5
	12	6	...	..	25	5
Class D	100	6	100	6	75	6

	—Length 60 Ft.—		—Length 65 Ft.—		—Length 70 Ft.—	
	Per Cent	Class	Per Cent	Class	Per Cent	Class
Class AA	75	1	100	1	100	1
	25	2	...	..	...	..
Class A	100	2	100	2	29	1
	...	..	...	..	71	2
Class B	17	2	25	2	20	2
	58	3	58	3	70	3
	25	4	17	4	10	4
Class C	40	4	50	4	...	..
	60	5	50	5	...	..
Class D	100	6	...	..	...	..

Municipal Taxes and Debts Under Utility and Municipal Operation

WHEN advocates of municipal ownership are concentrating on propaganda, the object of which is to convince people that their towns will be tax free if they put in municipal plants, such comparisons of official tax and debt data as have been presented in Minnesota lately are vitally important.

The Minnesota Taxpayers' Association (J. F. Reed, president) was quoted in the September 8, 1932, Minneapolis *Tribune* as follows:

A number of inquiries have been received from various parts of the state asking for informtaion regarding total tax rates, as well as the net debt, in cities and villages with privately owned and municipally owned lighting plants. The matter evidently is a live topic in many towns, since it is believed by many that some towns are taxless towns.

Therefore, we are inclosing a sheet with comparative rates* in typical cities and villages of the state. This sheet shows:

1. The total tax rates, as of 1931, in these cities and villages, as taken from data at the offices of the Minnesota Tax Commission, State Capitol, St. Paul.

2. The average debt in cities and villages with public and with private plants.

Our association, of course, maintains a neutral position on the matter of public or private plants, since these are purely community matters. Our interest naturally is confined to the tax phase of the question, and we are submitting to the many inquiries the data as we have found them. We have taken average towns.

The figures* of the Taxpayers' Association taken from the records of the State Tax Commission certainly demonstrate that municipally owned electric plants have not produced a taxless town in Minnesota despite the fact that they include the twenty municipal ownership towns most talked about, and most boasted about as examples of conspicuous success. The net debt figures‡ and ratio of net debt to assessed valuation are particularly interesting, in comparing private with municipal operation.

Two days after the quotation of the Taxpayers' Association the Minneapolis *Tribune* published the following editorial:

Municipal power plants and taxes

The idea that cities and villages having municipally owned power plants not only enjoy lower rates but are freed from a large part of their normal tax burden through the earnings of these electric plants is knocked in the head by a compilation recently made by the Minnesota Taxpayers' Association. This report takes twenty average Minnesota towns served by municipal plants and twenty whose power is furnished by privately owned companies and, in the terms of averages, tax rates are higher in the towns with municipal plants. The average tax rate in the twenty towns with municipally owned plants is 87.88 mills, while that for the twenty served by private companies is 84.25 mills. No less significant is the fact that the average net debt for the twenty cities with municipal plants is 10.6 per cent of their assessed valuations and that for those with private plants it is 6.1 per cent. The association's interest in this matter is only that of the taxpayer, and while it does not seek to interpret its compilation, the conclusions are obvious.

The theory that paying taxes through a city power plant is

**The Taxpayers' Association's data are presented in the second column of the accompanying table and in the table footnote marked. ‡See table.*

Comparison of Unit Taxes, Municipal Debts and Electric Bills in Minnesota Towns

City with Plant Privately Owned	Tax Rate Plus Special Assessment.‡	Municipal* Tax Rate in Mills	Municipal* Tax Rate Plus Special Assessment Rate	Average Bill† for Average Home 40 Kw.-Hr.	Average Bill† for Average Home 50 Kw.-Hr.	Municipal New Debt† in per Cent of Total Assessed Valuation
Albert Lea	83.95	28.89	31.83	$3.50	$4.25	10.3
Canby	64.60	21.40	21.40	2.97	3.30	0.7
Cloquet	75.37	24.50	24.87	2.61	2.90	0.7
Faribault	88.31	29.20	29.92	2.75	3.09	0.9
Glencoe	84.32	30.10	33.92	2.97	3.30	9.5
Glenwood	76.30	19.90	22.05	2.97	3.30	5.9
Hastings	105.77	39.95	45.72	2.75	3.09	18.3
Hutchinson	65.55	25.20	28.85	2.97	3.30	9.4
Little Falls	100.70	34.45	38.62	2.61	2.90	12.3
Long Prairie	93.66	17.70	18.06	2.61	2.90	....
Mankato	73.71	26.50	28.21	2.75	3.09	3.2
Montevideo	81.23	26.80	27.73	2.75	3.09	3.1
Morris	83.88	31.42	31.56	2.94	3.24	6.9
Northfield	90.54	19.15	23.00	2.75	3.09	4.6
Pipestone	90.33	33.10	34.23	2.97	3.30	12.6
Red Wing	81.24	31.80	35.54	2.75	3.09	1.9
Redwood Falls	87.29	23.50	30.29	2.97	3.30	5.9
St. Cloud	80.89	26.90	28.99	2.75	3.09	7.8
Tracy	89.87	29.70	37.27	2.97	3.30	6.7
Wabasha	87.56	14.18	20.38	2.97	3.30	2.3
Average	84.25	26.72	29.62	$2.86	$3.21	6.2
Average net bill less 10 per cent for tax				2.58	2.89	
City with Municipally Owned Plant						
Alexandria	103.05	28.87	43.22	$3.20	$3.55	12.9
Austin	83.13	27.48	29.02	3.04	3.80	6.6
Benson	110.00	42.50	48.60	3.85	4.75	21.6
Blue Earth	65.18	26.00	27.18	3.16	3.46	2.0
Detroit Lakes	95.70	25.90	25.90	2.45	3.00	10.4
Fairmont	88.34	27.40	37.77	2.88	3.33	17.2
Litchfield	87.54	20.60	21.04	3.60	4.50	3.4
Marshall	84.52	27.50	29.62	3.43	3.79	13.7
Moorehead	99.30	22.40	27.80	2.77	3.13	13.4
New Ulm	57.70	28.80	29.10	3.52	4.10	12.5
Owatonna	72.96	24.00	24.16	3.10	3.82	8.3
Rochester	74.83	27.89	29.72	1.84	2.07	3.8
Sleepy Eye	84.13	31.50	34.23	3.30	3.90	2.9
Springfield	70.83	18.00	18.23	3.70	4.50	2.2
Thief River Falls	109.64	26.60	36.04	3.49	4.30	24.2
Two Harbors	118.46	31.00	33.68	2.40	3.00	14.9
Virginia	74.80	27.50	29.50	.80	1.00	0.3
Wells	94.88	34.70	39.68	3.96	4.45	15.1
Willmar	97.97	32.80	40.78	3.85	4.75	14.6
Windom	84.81	30.10	32.91	3.49	3.85	11.8
Average	87.88	28.08	31.91	$3.09	$3.65	10.6

Per cent ‡ of average net debt to total valuation:
For cities with private plants..... 6.1
For cities with municipal plants..... 10.6

‡ Data from Minnesota Taxpayers' Association. J. F. Reed, president; includes state, county, school and municipal tax.

* Data from Minnesota Tax Commission for 1931 municipal tax returns.

† Figures from 1932 Year Book of Minnesota League of Municipalities. Assessed valuation includes real and personal property but not money and credits.

better than paying them directly is not borne out by these statistics. Not only have the cities with municipal plants gone more deeply into debt, probably to build their plants, but in many instances their taxes are also higher. A municipal power plant removes from the tax rolls an industry that contributes heavily to the support of government through taxation. That increases the burden on the rest of the property in the town. Some advocates of municipal ownership as tax relief choose to overlook these simple facts.

According to the figures made public by the association, Mankato, although a larger city than Austin, has a tax rate that is 10 mills lower. Austin has a municipal plant and Mankato has its electricity furnished by a privately owned company. Canby's rate of 64.6 mills is considerably lower than the 94.88 mill rate paid by Wells, and yet the latter has a municipally owned plant, while Canby has not. Cloquet is slightly larger than Willmar, which has a municipal plant, but Willmar's tax rate is 97.97 mills, while that of Cloquet, without the benefit of a municipal plant, is 75.37. There are undoubtedly variations in assessed valuations and other local factors that might make some difference in individual comparisons, but the report of the association should be sufficiently comprehensive to suggest that the advantage of municipal ownership as a means of tax relief are often more imaginary than real.

Charles F. Stuart, assistant to the president of the Northern States Power Company, reports that he became so interested in the Taxpayers' statement that he carried the investigation further. Since the Taxpayers' Association's figures include all taxes—state, county, school and municipal—Mr. Stuart investigated the municipal tax rates alone. As shown by the accompanying table, he found they too were higher in the municipal-ownership towns studied by the Taxpayers' Association. Furthermore, the net debt of these towns in terms of assessed valuation was found to be almost twice as high as that of towns having privately owned plants.

Finding this situation, Mr. Stuart concluded that there was only one other way in which these municipal-ownership towns might reflect a benefit to their communities—bills for service. Consequently he studied the official records of rates in the municipal-ownership and private-ownership towns and applied them to monthly consumptions of 40 and 50 kw.-hr. The results, given in the accompanying table, show that for both values of consumption the bill for service is less in Minnesota private-ownership towns than in municipal-ownership towns.

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Analyzing Transition Conditions

Investigation of the transition from induction-motor to synchronous-motor running conditions involves the solution of a differential equation, which necessitates a very laborious step process. As a consequence of this, the mathematical solution of the problem has been confined to a few special cases. Solutions have been obtained by means of the "integraph," but this machine has the disadvantage that it is purely a mechanical contrivance, which gives the operator no insight into the real nature of the problem he is investigating, declared H. Cotton and F. A. Hough recently.*

Research based on the examination of motion of a mechanical model whose equation of motion was the same as that of the synchronous-induction motor was related by these speakers. Cinematograph films were taken while the model was in motion and the angular position at any particular moment was determined from these films. Advantages claimed for this method were: (a) The constants of the model can be altered at will, so that the performance of any motor can be imitated; (b) the motion to be examined is a slow slip motion, and not the high speed of an actual motor, on which the slip motion required is superposed; (c) the model can be made very cheaply; (d) other phenomena, such as resynchronizing after falling out of step, can be investigated in addition to the pulling into step.

British Society for Advancement of Science.

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Examples of Interlocking on New Jersey System

By OSCAR BAUHAN
Engineer Substations,
Public Service Electric & Gas Company

On the Public Service Electric & Gas Company system in New Jersey the compulsory or inter-related key type of interlocks are usually applied on installations where flexibility of layout has been accompanied by increased complication from the standpoint of personnel. Such a system furnishes a definite safeguard to the personnel and compels a definite sequence of operation. While there is still some question as to whether or not it has in itself added an additional complication resulting in some sacrifice of flexibility, the system as a whole is considered satisfactory. Where the simple layout with perhaps somewhat less flexibility and open type of construction is used over-all interlocking schemes are avoided and more reliance placed on the operating personnel.

It has been found, however, that, regardless of simplicity, well-trained and experienced maintenance men will occasionally come in accidental contact with energized conductors. The safety of these men is a very vital problem and warrants a great deal of consideration. While metal-clad switchgear probably presents the best answer at the present time, it still cannot be considered as giving absolute complete protection, since there is usually that last barrier between live and dead equipment which eventually must be maintained. The complete feeling of safety which it tends to create may result in reduced vigilance and eventually a fatal accident. The increased cost involved in this type of equipment makes it hard to justify on the basis of safety alone. Accidents to maintenance men on any type of equipment are usually the result of this let-down of caution and it is felt that the situation can best be handled by forcibly bringing the men back to their normal good judgment and complete realization of the hazards involved. A partial answer to this problem has been attempted in the so-called "reminder interlocks,' two types of which are illustrated on the opposite page.

There is very little doubt that self-functioning mechanical interlocking is far superior to all other systems, assuming, of course, adequate design from the standpoint of ruggedness. This company makes use of this system whenever practicable. A particular application is shown in Fig. 4; in this case a mechanical interlock was applied between the starting and running switches on a synchonous condenser connected for series parallel starting. In general, such interlocks should be applied in such a way that the failure of the device will definitely block the succeeding operation.

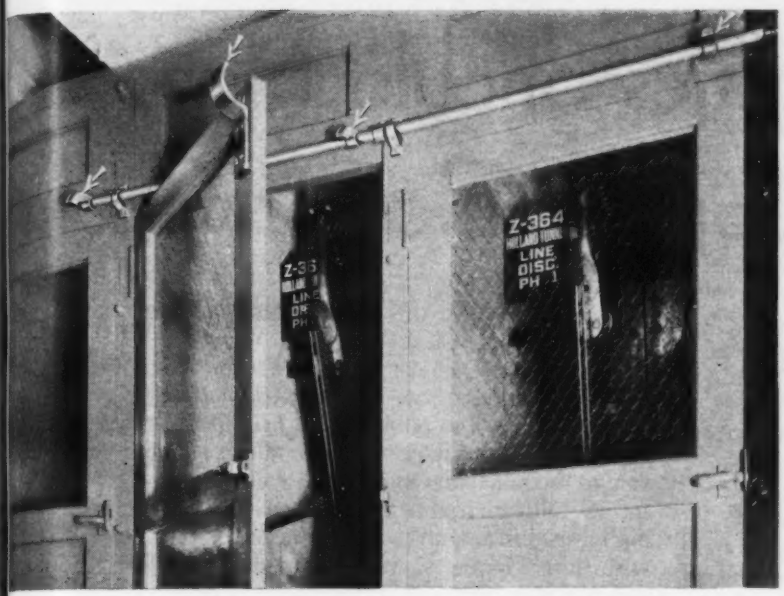


Fig. 1—Reminder interlock in gallery containing several compartments differing only in designation

This mechanical interlock is designed primarily to prevent an attendant opening two phase doors of dead equipment and one phase door of live equipment. The center door must be opened first and closed last. It closes against a spring so that failure to lock it will cause it to fly open again, thereby reminding the operator of his oversight.

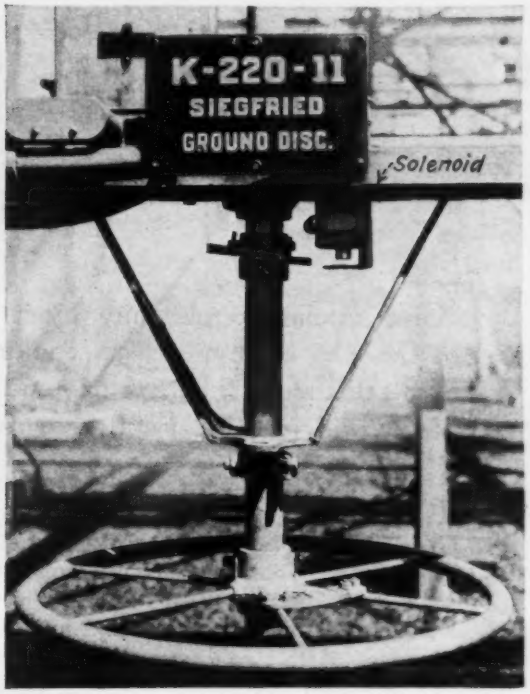


Fig. 2—Reminder interlock on line grounding switch

Except when the solenoid plunger is raised to allow the passage of projections from collar on hand-wheel shaft it is inconvenient to turn the wheel sufficiently to operate the ground switch. Since the solenoid is operated from the control room, an operating mistake can be made only by concurrent error of the system operator, station operator and his helper.

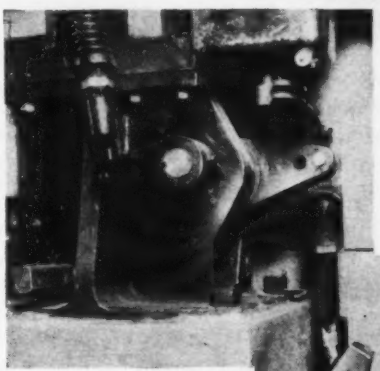


Fig. 3—Inter-related key system employed where mechanical interlocking is impracticable

Where needed flexibility of electrical layout has increased operating complication to the point where it is advisable to assist the operator in checking his procedure, the inter-related key system serves the purpose. In the case illustrated the oil circuit breaker and its disconnecting switches could not be easily interlocked mechanically.

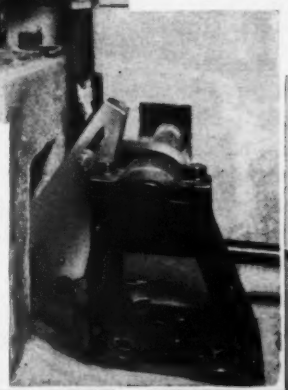
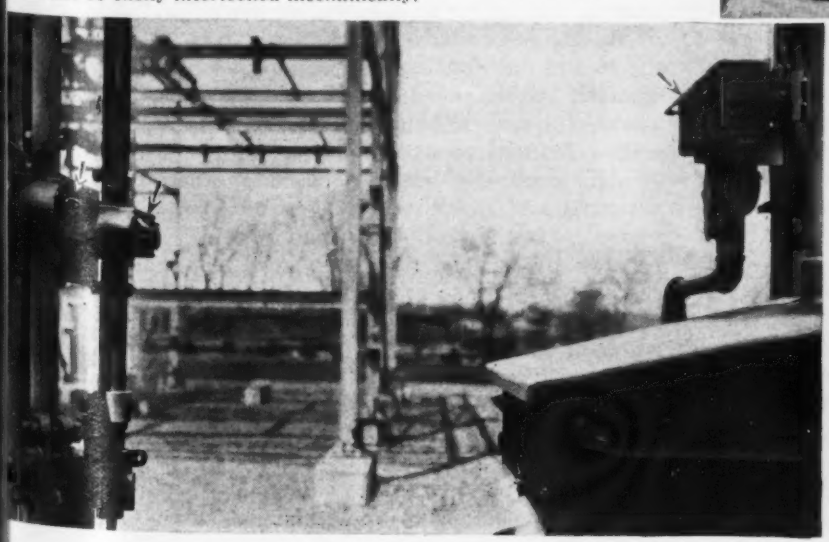
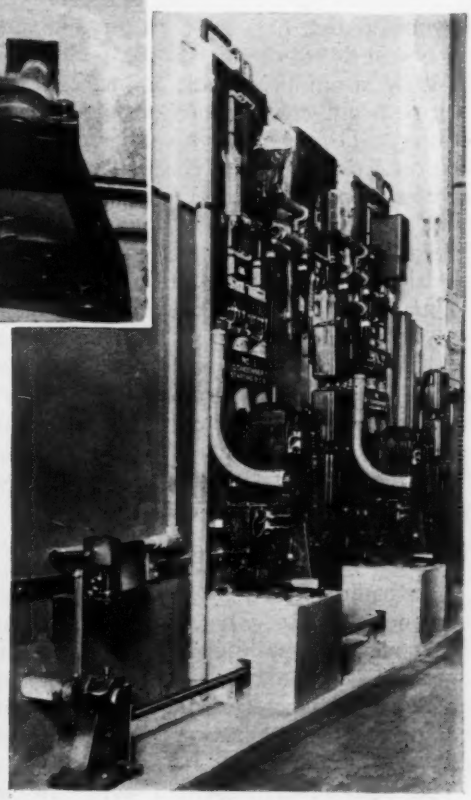


Fig. 4—Mechanical interlocking on starting and running switches of synchronous condenser

Used as a check on incorrect functioning of electrical control or other accidental operations.





Combination Utilities Should Not Suppress Electric Cooking

Give customers opportunity to decide between electric and gas cooking. Electric range is here to stay and its use will increase. Public has right to select the service it wants.

NEW electric service revenues of nearly $10,000,000 annually from 225,000 electric cooking customers to be added to the lines in the coming year is the promise of the National Electric Cookery Council to the electric utilities of this country. The plan provides an outlet to the manufacturers of electrical equipment for the sale of more than $15,000,000 of electric cooking apparatus. It provides for the electric contractors an opportunity to sell nearly $10,000,000 worth of electric wiring, but the most important and far-reaching result of its activities will be that 225,000 American women will, for the first time, enjoy clean, cool, comfortable and controlled electric cooking in their homes. Properly followed up, these new emissaries of electric cooking, with their fast, modern cooking machines, will do more to sell electric cooking to the remaining 10,000,000 present prospects than any other one agency. The personal recommendation of a friend always has been and always will be the best and the cheapest kind of advertising.

I know a number in this audience who are thoroughly informed and consequently thoroughly sold on electric cooking. There can be no other answer if one is in a position to approach the subject with an open mind, unfettered by tradition or company policies. There are already enough advocates of electric cooking in the United States to make a creditable showing of the co-operative efforts of the National Electric Cookery Council, but it is essential to the success which should attend these efforts that every one in the electric utility industry lend such co-operation as is possible during the coming year. There are only a few relatively low hurdles which those who are lukewarm on electric cooking still have to jump in order to make the electric utility co-operation 100 per cent. It is to these lukewarmers that I would address a few friendly remarks.

First—Be an electric range user

You can't speak with full authority unless you are. Buy one of those wonderful colorful automatic ranges that modernize the kitchen and bring it up to date with your office equipment. How can you expect to inspire confidence in your statements about electric cooking if people know that you cook with wood, coal, oil or what-not.

The best advertisement I ever saw in a restaurant was a picture of the well-fed proprietor, under which was his name and this cryptic remark: "He eats at his own restaurant."

If we don't believe enough in the things we sell to use them ourselves, we cannot expect to enthuse our own employees and the public over their use. Install a range yourself. Make it possible for all employees to get the ranges installed at cost and on easy terms. Manufacturers will undoubtedly co-operate by making special discounts for employees. Take care of these installations with your home service departments because electric cooking is a new and different method of cooking.

It is sometimes necessary to explain to the housewife that the meat is actually roasting, even though she is not. Modern electric cooking is a new experience. The new ranges are fast. The old types were slow. Bring your present electric range customers up to date with new units. Be modern yourself! Install that new electric range for the wife. She will like it and it is contagious.

Second—Don't let your relations with the gas business becloud your vision!

Many of us, and I am included, are associated with companies selling both gas and electric service. We have our investment in gas production and distribution property. Our customers use electricity for lighting and miscellaneous appliances and gas for cooking and water heating. The division of the business in this manner has been a natural outgrowth of the development of appliances and rates for service.

Most of us remember living in houses lighted exclusively with open-flame gasjets or the famous "Welsbach burners." We thought little of the effect of the open-gas flame on the room atmosphere, the inconvenience of using matches and the inflexibility of the light source because what we then had was so much better than the kerosene lamp. Gas lighting for general use died hard, and it has only been in recent years that modern gas company offices have been lighted with electric lamps.

It was inevitable that gas lighting should go, as the public became acquainted with the convenient, clean, healthful electric lamp and the rates for electric service were reduced to a competitive point. The consuming public made the selection based on that which pleased it most and it will continue to do so in the future regardless of the vendor's wishes. Gas companies were not materially harmed by the loss of the lighting business as it took place so gradually over a period of years as to permit development of sales in other fields.

Now comes the electric range with its first nation-wide bid for recognition. What are the utilities selling both electric and gas service to do about this situation? At the present time 11,000,000 out of nearly 21,000,000 wired homes in the United States have rates available which will permit electric cooking. Are the advantages of electric cooking to be withheld by some process from

By G. W. VAN DERZEE*

Vice-President Milwaukee Electric Railway & Light Company, Milwaukee, Wis.

o Favor Gas

the other 10,000,000 customers? Is the gas business to be given the edge so as to avoid stiff competition with electric cooking? A wise policy for a combination company to adopt which will best serve the mutual interests of the customers and the company is, indeed, difficult to determine. The problems that each such company has to meet are different and no one policy can be determined that would be generally acceptable.

There exists a large market for electric cooking service with many combination companies beyond the economical limits of the gas mains.

> **On the other hand, it would seem to place our industry in a better position with the public if the customer is able to use electric ranges and any other commercial electrical device at reasonable rates anywhere on the system of an electric utility, no matter whether it sells gas in the same community or not. The extent to which one class of service or the other is actually pushed by the utility is another matter, and is indepedent of rate schedules. But for best relations with the public we should have such rates on file as to avoid being charged with suppressing one form of service for the benefit of another.**

The far-seeing executive will buy a modern electric range, even if he runs a gas business, and find out for himself what there is to this electric cooking business. He is likely to decide that electric cooking is here to stay and that its use will substantially increase. He will, or at least he should, as a matter of good public policy, put the electric rate schedules in shape as soon as practicable so that those of his electric customers who wish to cook with electricity instead of gas may do so.

The utility industry cannot go wrong on a long-term policy of first offering the customer the kind of service, either electric or gas, that best fits his needs. If the customer does not want what best fits his needs, then sell him what he wants. If he has no choice and either service will serve equally well, then the company may, without fear of criticism, urge its own preference, and only then.

My third and last suggestion is to develop among your customers a desire for the "all-electric home."

Notwithstanding my comments about the gas business, this is, after all, a convention of electrical interests and the "all-electric home" ought to be a beacon to our industry. The experience of the Milwaukee Electric Railway & Light Company with this idea may be of interest.

About two years ago we introduced to the readers of our advertising the idea of the "all-electric home" and described its many advantages. We sought to create a desire for an "all-electric home" with the idea in mind that it would become, in time, the unconscious, if not the actual, aim of every home owner. We adopted a slogan which appears as part of our daily electric service advertising, showing in bold-faced type this unqualified statement: "The Modern Home Is All Electric," and below this, in small type, the words "For Convenience, Cleanliness, Comfort, Economy and Safety." As a result of continuous advertising, our customers are beginning to believe, and rightfully so, that the modern home *is* all electric, and are looking forward to attaining that desirable type of home. This idea is further stimulated by arranging with customers who are constructing new all-electric homes to permit visitors to go through them before being occupied. We furnish a neat metal sign for the front yard which can be spotlighted and reads "Another All-Electric Home."

Into this prepared atmosphere we are now gradually injecting electric cooking and our new system of electric water heating, and salesmen have many favorable reactions to their frequent inquiries to customers, "Why not make your home all electric?" This leads to a discussion with the customer of the electric range and the electric water heater, which are the usual missing links.

The "all-electric home" is a goal to be achieved by our industry. Its ultimate attainment is predicted on the natural desire of our customers for the best that there is in home life. Awaken the public desire for the "all-electric home" now and the problems of selling electric cooking in the next few years will be just so much easier. Don't be a lukewarmer on electric cooking. Get hot! Let's go!

The electric range represents modernity. For any electric utility interest to try to withhold the modern thing from customers is to be recreant to the very basic principles of the electrical industry and to make a vain attempt to hold back progress. Robert Herrick, away back 300 years ago, covered the case when he wrote:

> Thus times do shift—each thing his turn does hold;
> New things succeed, as former things grow old.

▼

Are Power Costs Ruinous?

Under this caption the Chicago Sunday *Tribune* has published an editorial citing its own experience with reference to the cost of power. Disclaiming any intention to defend all, or indeed any, of the practices of the power companies the paper points out that the allegation of "ruinous rates" for power is ill-founded.

To discover if rates for power are ruinous, the editorial points out, the proper comparison lies between the cost of electricity to the consumer and the total of his cost. If in ordinary manufacturing processes the cost of electric power amounted, say, to as much as 10 per cent of the whole cost of producing an article, it might be reasonable to say that excessive power costs might be a grave handicap to business, states the editorial. A 50 per cent reduction in the cost of power would mean a 5 per cent reduction in all costs, a saving of a very substantial amount.

A *Tribune* subsidiary manufactures paper. The manu-

**Presented at Executives' Conference, Great Lakes Division, N.E.L.A., French Lick Springs, Indiana.*

facture of paper is an industry in which power costs are so important that paper mills are commonly located where power is particularly cheap. As a matter of fact, a shade more than 10 per cent of the whole cost of producing its paper went to the Ontario Hydro Commission for power generated at Niagara Falls. A shade less than 9 per cent of the whole cost of making the paper and delivering it at Chicago is represented by electrical power. Modernization, it is stated, would reduce the cost of purchased power to 6.6 per cent of the total cost of operation.

Other percentages based on this newspaper's own experience are: Manufacture of ink, 2.1 per cent; operating an office building, 1.5 per cent of total revenue; operating a radio station, 2.5 per cent of the total operating cost (saxophone costs run much higher); operating a garage, 0.75 per cent of operating costs, excluding wages of chauffeurs; warehouse and dock, 0.7 per cent.

The electricity consumed in setting the type in printing the newspaper costs about one-fortieth of a cent per copy. The combined costs of all the electricity used in printing, distributing, advertising, editing and managing it run to a little more than one-thirtieth of a cent per copy. We are told that the rates paid are in no sense special rates. They are standard.

"Power is one of those commodities which is now so cheap that its cost is an almost negligible item."

▼

Dynamic Braking for Large Induction Motors

By W. B. SNYDER

Industrial Engineering Department, General Electric Company

Wound-rotor induction motors with flywheels are commonly applied to constant-speed drives carrying highly fluctuating loads, such as steel mill main roll drives and motor-driven generators supplying power to reversing mills and mine hoists. Since such drives may coast from 30 to 60 minutes before coming to rest it is obviously essential to provide some means of stopping them quickly in case of trouble. Wound-rotor motors are commonly plugged to rest by reversing the phase rotation of the applied voltage, as this braking means is the most economical when the drives must be reversed. However, for induction motor drives where no reversal is required, dynamic braking, by applying direct current to the motor stator and dissipating the stored energy of the rotating parts in the secondary resistance, in many cases presents distinct advantages.

The main primary connections of induction motors arranged for plugging and for dynamic braking are shown in Fig. 1.

In some cases other savings than those in oil circuit breaker costs may be realized. If magnetic secondary control is used the plugging section of resistance and the plugging contactor can be omitted. If a slip regulator is used this may sometimes be made smaller if it is not arranged for plugging. Furthermore, an induction motor to be braked dynamically may be designed with a higher secondary voltage and lower secondary current than one which is to be plugged, since the rotor is not subjected to the double voltage occurring during plugging. Thus the secondary control may be of smaller ampere capacity, and consequently cheaper.

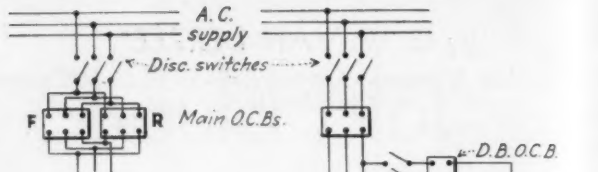
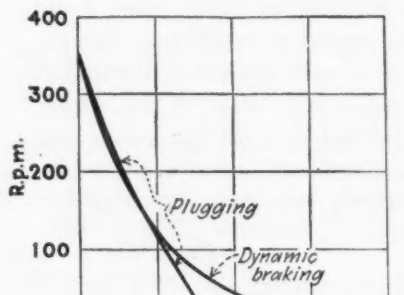


Fig. 1—Main primary connections of induction motors for plugging and dynamic braking

It will be observed that equipment arranged for plugging requires two primary oil circuit breakers, which must be of equal rupturing and short-time carrying capacity. The equipment for dynamic braking uses only one main breaker, but requires an additional double-pole oil circuit breaker with disconnecting switches for applying direct current to the motor primary and a low-voltage exciter and control for supplying this direct current. Thus more equipment is required with the dynamic braking control. However, the oil circuit breaker applying d.c. to the motor primary can be small and inexpensive, as the only requirements for it are that it be insulated for the voltage of the a.c. circuit and that it be capable of carrying the direct-current excitation of the main motor. Many present-day power systems require such large breakers that the omission of one primary breaker will more than pay for the additional equipment required for dynamic braking.



The curve marked **plugging** shows the decelerating time during plugging, with the plugging inrush limited to 135 per cent of full load current. The other shows the decelerating time during dynamic braking, using a secondary resistance which will produce a starting inrush of 135 per cent and with sufficient stator excitation to produce 112.5 per cent rotor voltage at synchronism.

Fig. 2—Deceleration of a flywheel motor-generator set using plugging and dynamic braking

There is also a small energy saving if dynamic braking is used rather than plugging. For example, the energy saving due to dynamic braking on a flywheel set supplying power to a 7,000-hp. reversing motor will amount to 70 kw.-hr. for each stop.

Even though low voltage d.c. is available, a separate generator should always be used for exciting a high-voltage motor during the dynamic braking period. Even the best of interlocking schemes have been known to fail, and the cost of the additional exciter may be regarded as good insurance against damage which would occur if high voltage a.c. were impressed on the plant d.c. circuit.

The decelerating time of the wound-rotor motor during dynamic braking may readily be calculated. On any motor of normal design sufficient d.c. excitation may be

provided to produce a rotor voltage at synchronous speed 10 to 15 per cent higher than the normal open-circuit standstill voltage. This voltage, impressed across the starting resistor, will produce a torque correspondingly higher than the starting torque. For the values of resistance ordinarily used in starting, the dynamic braking speed torque curve may be regarded as a straight line running from the maximum torque at synchronous speed, as determined above, to zero torque at zero speed. Adding the friction and windage torques to this gives the total decelerating torque curve, and from this and the stored energy in the drive the decelerating time is calculated in the usual manner. This method neglects minor losses such as rotor core loss, but is accurate enough for all practical purposes.

The relative effectiveness of plugging and of dynamic braking in bringing to rest a flywheel set supplying power to a 7,000-hp. direct-current reversing motor is illustrated in Fig. 2. This set is driven by a 5,000-hp.-360-r.p.m. induction motor and has a stored energy of 175,000 hp.-seconds at synchronous speed. It is apparent that with either decelerating means shorter stopping time can be obtained by decreasing the rotor resistance as the speed decreases. However, quicker stopping time is usually not required, and so these additional complications are not necessary.

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New Methods and Equipment Studied on Demonstration Line

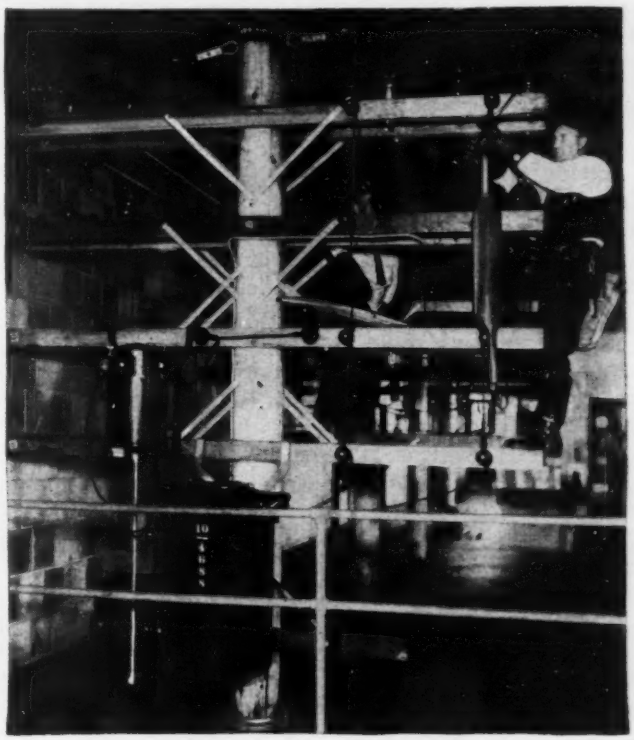
By P. R. KNAPP
Superintendent of Distribution
Toledo Edison Company, Toledo, Ohio

To serve as a trying-out place where circuit arrangements may be studied and the adaptability of new equipment may be determined and to demonstrate to foremen and linemen standard and special types of construction that often are not clear from blueprints—these are additional functions that have been discovered for a length of overhead line built for the training of workmen by the Toledo Edison Company indoors in its new service station. Such replica lines erected by other utilities have been used almost exclusively for training employees in safe procedures and methods of work, but it appears from the Toledo experience that the additional uses found for the line are as valuable as the usual ones.

This sample line is composed of six poles and includes: One corner pole, two dead-end poles, three straight-line poles, one three-phase power bank installation, one single-phase lighting installation from a single transformer, one single-phase lighting installation from two transformers in parallel, one 4,000-volt, four-wire primary circuit, single-phase and three-phase secondaries and one series incandescent circuit consisting of an R. O. transformer, contactor, time clock and street light.

The benefits derived have been many. The foremen, in the past, did not all interpret construction blueprints alike, and consequently their installations reflected these variations. It has been possible to hold classes to point out to the linemen certain safety features of line construction which must be rigidly adhered to. The line is located in a room frequented by the linemen when going on or off duty. They thus get a chance to study it and turn in suggestions for improvement. The line can be energized with proper safety precautions and the men allowed to work under conditions closely approximating those in the field. They are thus taught how to conduct themselves properly on the pole, and the correct manner of executing the work, including the placing of proper rubber and other protective devices. The line must be treated as energized by the linemen at all times, although during most of the training the circuits are not energized.

Many of the connections are made by clamps, and it is therefore possible for the apparatus to be disconnected by the superintendent and a given lineman instructed to connect it up properly. This tests his knowledge of the service. He may be instructed in the variations of connections which have to be used in case



Training linemen on indoor line

of trouble, such as isolating one transformer in a three-phase bank and utilizing the remaining two in open-delta operation.

The indoor line has, in addition, proved valuable in instructing men regarding the operation of new types of equipment, such as contactors, oil switches, cutouts and transformers, before it is placed in regular service on the distribution system. These instructions serve not only in reducing the risks involved in the work of installing operating devices with which they may not be familiar, but also aid materially in restoring service.

All organizations now have to train and develop a great part of their personnel. Even if experienced men are hired who were developed by other systems it is advisable to give them training in the methods of the company for which they are now working. This sample line provides for both of these measures.

The line has proved to be of real value in studying the best means of arranging circuits and testing the practicability of new types of equipment.

Convincing Customers of Value of Outdoor Lighting

IN THE first month of the recently inaugurated concentrated activity upon outdoor lighting the Philadelphia Electric Company added 326 kw. of connected load to its system, representing an estimated increase in annual revenue of $19,560. The success of this activity is attributed by the utility company to the adoption of a well-organized routine planned in co-operation with the lighting equipment manufacturers and to the perfect co-ordination and ethics of the manufacturers' representatives in presenting to the merchant the advantages of good lighting.

The lighting salesmen of the Philadelphia Electric Company are charged solely with promotional work in stressing to a customer the importance of proper lighting and its sales value to him. If the customer is interested a survey is made by the utility company lighting service man and plans are prepared for the proposed installation. These plans are presented to the customers by the lighting salesman and copies are sent to the co-operating manufacturers. It is then the duty of the sales representatives of these manufacturers to contact the prospect in the interest of making the installation.

As further evidence that ethical co-operation makes for success, reports of additional locations which had been overlooked in the preparation of the prospect list are being turned in from time to time by the lighting equipment representatives. Publicity matter is sent to these new prospects with a follow-up by the Philadelphia Electric Company lighting salesman. If the prospect is found to be interested specifications are prepared and forwarded not only to the company whose salesman turned in the lead but to co-operating manufacturers.

How the start was made

In the first five months of 1932, before special attention was paid to developing this class of business, 33 specifications were prepared for outdoor floodlighting, as compared to 140 written specifications and 60 verbal recommendations made between June 15 and July 21, the first month of the present campaign. On the former date the first of a series of broadsides was mailed to prospective customers for this class of service and these folders, followed by others at regular intervals, played a vital part in the creation of new business.

Here again was a perfect tie-in with the co-operating equipment manufacturers, who followed the mailings of the Philadelphia Electric Company with broadsides on the same subject and stressing the advantages of their own particular lighting equipment.

While the preceding figures cover only the amount of new business to the utility company, the activity has resulted in the sale of a considerable amount of lighting equipment and wiring which has promoted business for the electrical contractors. The manufacturers have expressed their satisfaction not only with the way that the activity is being conducted but with the results which they are obtaining. In the school lighting activity which is now being conducted and the store lighting activity which will shortly* start additional manufacturers are taking part.

According to G. Bertram Regar, manager of the company's lighting department, mail publicity serves little or no purpose unless it is followed by personal sales contact, but it is extremely valuable as an introduction when the personal follow-up is made.

Four broadsides were utilized, two pieces being sent to each prospect. Prospects were classified into two groups. Class 1, mailings "A" and "B," went to 788 prospects and was denominated a sales appeal broadside. This covered roadhouses, tourist inns, barbecue stands, gas stations, sports fields, golf-driving courses, swimming pools, model homes, parking lots, landscape offices and displays. Class 2, mailings "A" and "B," went to 649 prospects. This was known as identification, prestige and utilization and covered commercial, administrative and institutional buildings, playgrounds, residential lawns and gardens, material storage yards and general protective applications. The broadsides were mailed beginning June 15 in batches of 200 and 300 a week to facilitate proper coverage by lighting salesmen.

The company's lighting salesmen began to contact on June 20, and by July 21 fourteen installations had been completed from the written specifications requested by interested prospects. This entailed a total connected load of 246 kw. From the reports of the lighting men it appears that practically every one of the prospects asking for specifications is vitally interested and expects to make an electrical installation at present or in the near future. Only fifteen return cards were received in the first month asking for further information on outdoor lighting, which supports Mr. Regar's belief that the chief value of the mailing pieces lies in their paving the way for lighting salesmen's calls. The 60 verbal recommendations to the prospects or to the electrical contractors whom they called in to do the work represented 80 kw. addition to the system connected load. Many of the larger proposed installations will not be made possibility for several months,* depending on business conditions. The largest installation sold in the first month was one requiring 76 floodlights for night baseball, introduced to Philadelphia with gratifying results.

The records from the inception of the plan to September 6 show that 190 written specifications have been prepared. Of these, 29 have been carried out with an additional load of 372.9 kw. According to reports of the utility lighting salesmen as well as those of the co-operating manufacturers a great part of the remaining 161 are bright prospects for business in the very near

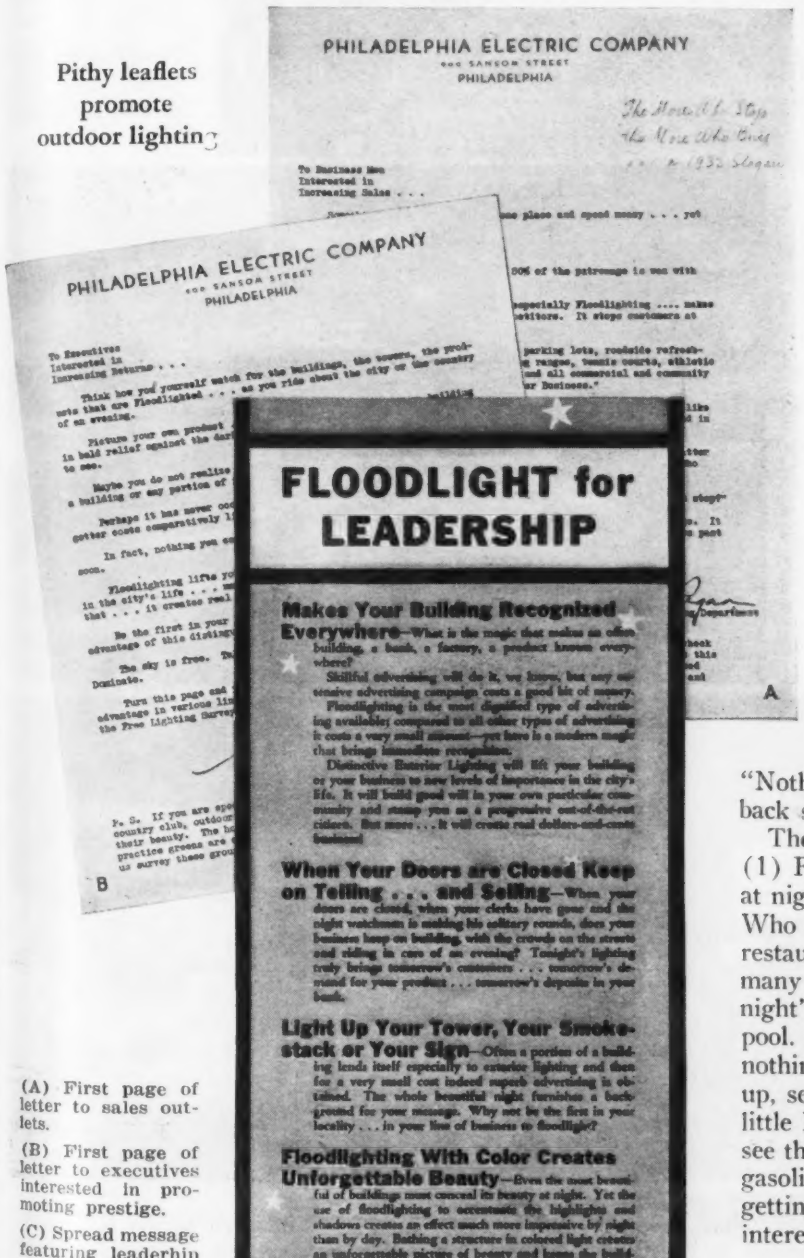
**Article written early in August.*

future. In addition to the above, 65 verbal recommendations have been carried out with an additional load of 126.7 kw. In other words, a total additional load of 499.6 kw. has been secured with an approximate annual revenue of $29,976.

Each leaflet was a single sheet folded to provide four 8½x11-in. pages by using both sides of the paper. Class 1 leaflets, having the direct sales appeal, carried as a 1932 slogan in the upper right-hand corner "The More Who Stop, the More Who Buy." All leaflets were compactly phrased with short, striking sentences, many of which constitute lighting slogans in themselves. Naturally all emphasized the attention-compelling power of night lighting and the opportunities for original and pioneering displays in particular neighborhoods and in particular businesses and industries. From start to finish the importance of exercising leadership through local or class displays by the skillful use of light is stressed.

The front page of each leaflet comprises a letter to the prospect signed by the manager of the lighting department; the next two pages form an inside double-page spread with halftones of representative installations in Philadelphia territory, short descriptive captions with selling value and pithy comments on the value of outdoor lighting and how to achieve its benefits. The last page lists typical customers using this class of service. Representative quotations from the series follow:

Pithy leaflets promote outdoor lighting


PHILADELPHIA ELECTRIC COMPANY
PHILADELPHIA
PHILADELPHIA ELECTRIC COMPANY
PHILADELPHIA
FLOODLIGHT for LEADERSHIP
Makes Your Building Recognized Everywhere
When Your Doors are Closed Keep on Telling . . . and Selling
Light Up Your Tower, Your Smoke-stack or Your Sign
Floodlighting With Color Creates Unforgettable Beauty
Hundreds are Now Getting Our Free Lighting Survey, Ask for It
A
B
C

(A) First page of letter to sales outlets.

(B) First page of letter to executives interested in promoting prestige.

(C) Spread message featuring leaderhip by floodlighting methods.

Letter "A" to Class 1 Prospects

(Business Men Interested in Increasing Sales)

The double-page spread reproduces six night photographs of floodlighted installations showing the possibilities realized in a parking lot, wayside refreshment inn. swimming pool, industrial plant water tower, quick-lunch establishment and gasoline-filling station.

This spread carries the slogan "Invite Night Trade with Brightness," pointing out that "Floodlighting is the force that applies the brakes and makes 'em stop." The prospect is urged to do this one thing to make his location stand out from his competitors, and is told that bright outdoor lighting stops new customers, brings old ones back; that he can make night his peak-sale period, open up a whole new vein of business with light, and by illuminating entrances, signs, equipment, buildings and sports projects attract patronage. A good outdoor lighting installation, the letter states, costs little and can be operated for a few cents a day. "Nothing else you can buy for so little gives you back so much," the message says.

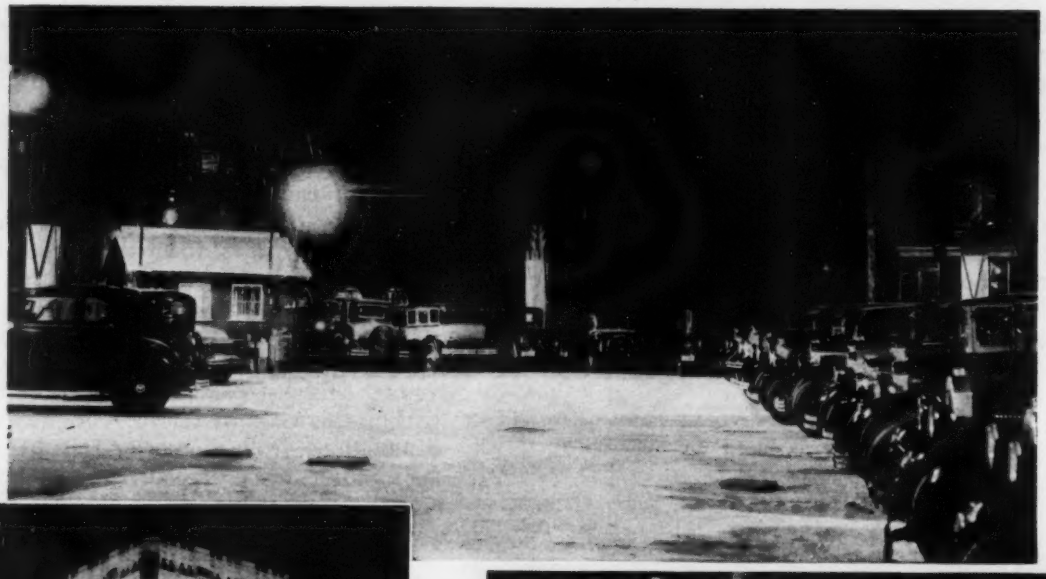
The captions of the six night views are entitled: (1) Floodlighting steers them into this parking lot at night and brings them back in the daytime. (2) Who could pass this brilliantly lighted wayside restaurant refreshment inn without stopping? Not many motorists do! (3) "Pool crowded every night" is the report for this floodlighted swimming pool. . . . (4) For years this tower meant nothing in the life of this tire company. Lighted up, see how valuable it becomes. (5) A veritable little Palace of Light on a city corner! Thousands see this message and answer it. (6) Increase your gasoline sales as this station did with attention-getting outdoor lighting. These proved to be very interesting to customers.

Letter "B" to Class 1 Prospects

On the first page is this letter:

"Have you asked yourself this question, 'Have I enough light to make them stop!'

"Make this test some night. Ride along the road or street where your business is located and see



Brilliant lighting **draws customers to this used car lot**

Floodlighting steers them into this parking lot at night

Why not unusual lighting effects on your building?

No driving by this cheery wayside restaurant to see what the next one's like

Night time is peak sales time at this gas station

if your place dramatically catches the eye. Does it stand out distinctly from your competitors?

"If it doesn't, here's a very definite way for you to begin to build up your sales—not next season—but immediately.

"Install more and better outdoor lighting. You can make your building, your signs and grounds stand out in bold relief, and begin to win new trade from the very night you light up.

"The cost? You'll be surprised, as most operators are, at the low cost of equipment and operation.

"Study this message on outdoor lighting. Then take advantage of the free lighting survey we are offering at this time. Just sign the inclosed card and drop it into the mail today, or call the nearest Philadelphia Electric Company office and ask for customers' service. This will involve no obligation to buy, but will bring you most helpful information."

The two-page spread in this letter shows six pictures and captions of (1) a lunch place ("No driving by this cheery wayside restaurant to see 'what the next one's like'"); (2) a used car lot ("Brilliant lighting draws customers . . . Up go sales figures!"); (3) a filling station ("Night time is peak sales time at this gasoline station . . . thanks to floodlighting"); (4) a model home ("The model home lends itself particularly to floodlighting. It permits night visiting . . . and selling"); (5) a golf-driving range ("Sports at night . . . the new American hobby! This golf-driving range catches customers with light"); (6) a root beer stand ("Let's stop here," clamors the crowd in the car when they come upon this sparkling soft drink stand).

The spread message also urges the prospect to light up before his competitor does, declaring that "Salesmanship today is Showmanship"; that competition is too keen to depend on products or services alone to win sales, and emphasizing the value of the spotlight, which in the form of outdoor lighting lifts trade dependent on passing motorists from the common rut to outstanding success . . . The brightly lighted place signals from a distance to motorists looking for service or food, giving them plenty of time for a smooth, normal stop.

Letter "A" to Class 2 Prospects

(Executives Interested in Increasing Returns)

Here the double-page spread depicts two banks, an office building, insurance establishment, factory and dairy under floodlighting, the captions featuring the confidence, cheer, interest and distinction brought to these places by proper illumination. It is pointed out that the factory along the railroad tracks has a matchless opportunity to sell name, good-will and product to passing travelers through lighting displays; how a fine building does its most productive advertising after sundown through outdoor lighting and how it lies within the power of any man to raise his business above the common run and make it prominent in the city life. Good locations are costly, but floodlighting wins distinction in any neighborhood and costs only the smallest fractional per cent of overhead.

Letter "B" to Class 2 Prospects

This letter indicates how to lift a business from routine success to leadership through proper lighting. It points out that years of constant, steady building will not bring such instantaneous recognition as floodlighting. It calls attention to how floodlighted buildings, banks and products remain "high-lighted" in memory, the low cost of such service and the ease with which it can be considered for individual cases. The outdoor lighting of grounds around homes, country clubs and athletic areas is touched upon as an opportunity for architectural and æsthetic enhancement.

The double-page picture spread features "Floodlight for Leadership," showing: (1) A service station for motorists in which many separate services are illuminated well; (2) a bank ("Safety for night depositors as well as beauty considerations were responsible for these curb standard floodlights"); (3) another bank ("Beauty . . . dignity . . . the finest type of advertising . . . is why floodlighting is more and more used by banking institutions"); (4) a factory whose beauty and advertising value are enhanced by electricity; (5) an Edison building identified miles away by its lighting ("Why not unusual lighting for your own building?"); (6) floodlighted coal silos in which a name and a product are electrically emblazoned on the public mind.

The message of the spread also stresses the recognition attainable by floodlighting for buildings, products, services and the opportunities offered by the use of colored lighting.

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Customers' Wiring Has Been Neglected

By H. R. SEARING*

General Superintendent Distribution Operations
New York Edison Company

For years there has been a line of demarkation of ownership of service facilities, usually at the service switch, with the utility owning and maintaining that part of the system up to the switch and the customer owning the portion beyond the switch. But both component parts must be considered in determining the cost of the system and the minimum over-all cost must be obtained if the maximum use is to be made of the service. The utility group has felt for many years that the portion of the electrical system beyond the service switch has not received the engineering treatment that the system ahead of the switch has received. Some of the reasons for the lack of progress in wiring are as follows:

The ownership of this part of the system is divided among a multitude of customers who are responsible for its proper maintenance. Experience has shown that this part of the system does not receive as good maintenance as that part for which the utilities are responsible. There has been a tendency on the part of consulting engineers and contractors, therefore, to install a much higher grade system in the fond hope that the lack of maintenance will not cause as much trouble as poor maintenance would cause on a cheaper system. The difficulties of enforcing regulations can well be imagined. There has been considerable exploitation in this field by selfishly interested parties, including portions of the manufacturing, contracting and regulatory groups.

The situation has been bedeviled with propaganda and

**Excerpt from address before New York Power Group, A.I.E.E.*

tomtoms have been beaten with respect to safety. The element of fear has been preached from the housetops. By and large, this has all been done by groups who should recognize that destructive criticism from within must eventually and inevitably pull down the temple upon the heads of all. We believe that undue emphasis has been placed on the fear angle; we believe that unreasonable regulations are unenforceable and we believe that the business is being stifled by these tendencies. The cost of installing additional new outlets in an occupied apartment is so high as to be almost prohibitive. We know that additional outlets are made available in apartment houses by the well-known expedients of lamp cord and insulated staples. We know from our contacts with our customers that such illegal extensions exist and have run for many years in the majority of New York apartments.

We are bending every effort to educate builders to the advantages of plenty of outlets in the initial installation, but we believe that the fact that hundreds of thousands of illegal extensions exist and give service is a first-class indication that the very high grade of wiring required to be legal probably is unnecessary and certainly too expensive. We do *not* believe that cheaper wiring necessarily must be less safe, and we do *not* recommend that wiring of houses be accomplished by the scissor-and-tackhammer method. We certainly do not care to be accused of endangering the lives of the hapless residents by sponsoring unsafe practices.

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READERS' FORUM

Recommends Illumination Unit Based on Effect

To the Editor of the ELECTRICAL WORLD:

During the course of some recent work on illumination—much of which was concerned with the literature on the industrial aspects of the subject appearing during the last decade—the writer has often had occasion to wonder at the "apotheosis" of the foot-candle as a measuring stick. Writers who must have often entered a factory, where the illumination was under 25 foot-candles, from outdoors, where the illumination at noontime might have been as high as 10,000 foot-candles, seem to find nothing at all absurd in meticulously assigning, under the general heading "glass works," 10 to 6 foot-candles for "mix and furnace rooms" and 12 to 8 foot-candles for "grinding, cutting glass to size." No factory worker in the world would ever notice the difference between 10 and 12 foot-candles. If you raised the level from 10 to 20, he might say, "It seems a little brighter here today," and then, if you raised it from 20 to 40, he might say, "Well, it seems another step brighter today than it did yesterday." The differences in intensities between 10, 20, 40 and 80 foot-candles would seem like three equal steps to him. That's the way his eyes, and yours, and mine are built.

Why not start thinking about a lighting unit, to be called the "vis," which varies as the logarithm of intensities? Thus, we might set up a table of equivalents as follows:

Vis	Foot-Candles	Vis	Foot-Candles
1	2	5	32
2	4	6	64
3	8	7	128
4	16	8	256

A table of recommended values in vis would be simpler than the present standard one, because many portions of the old table could be lumped together under a single vis rating. Take, for example, that portion of the present table referring to chemical works: "Hand furnaces, boiling tanks, stationary driers, stationary or gravity crystallizing" are given a 5-3 foot-candle rating; "mechanical furnaces, generators and stills, mechanical driers, evaporators, filtration" are given a recommended rating of 6-4 foot-candles; "tanks for cooking, extractors, percolators, nitrators, electrolytic cells" are listed as requiring 10-6 foot-candles. The proposed table would simply list "chemical works, 3 vis," and have done with it.

A vis table would furnish a more convenient means of comparing the recommended light values for various industrial operations in terms of seeing. Ratings of 3, 4, and 5 vis, respectively, for different tasks, would mean that there would be three equally spaced levels of seeing, not equally spaced intensity levels, required. Finally, the new table would be more honest, for it is not to be denied that the present accepted standard table parades under a false cloak of scientific precision.

A sample of what the present recommended standard table might be made to look like in terms of vis is given herewith:

Class of Work	Vis
Aisles, stairways, passageways	1
Assembling:	
Rough	3
Medium	4
Fine	5
Extra fine	7
Automobile manufacturing:	
General	4
Body manufacturing—assembling, finishing, inspecting	7
Bakeries	4
Bookbinding	4
Candy making	4
Canning and preserving	4
Chemical works	3

The whole standard table could be quickly translated in this manner. Gradations between foot-candle levels of 10, 12 and 15 could be eliminated and real see levels of lighting used.

CARL HEYEL.
3315 E. Woodmont Avenue,
Cincinnati, Ohio.

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Charts for Street-Lighting Schedules

To the Editor of the ELECTRICAL WORLD:

With reference to the article "A Basis for Street-Lighting Schedules," by P. R. Knapp, which appeared in your September 24 issue, many of your readers will no doubt be interested to know that we have worked out "Sauter" astronomic dial charts for all-night or half-night lighting schedules on the same basis as the principle outlined in Mr. Knapp's article. They save figuring as they are correct for any locality in the United States. This chart we offer free to utility engineers.

J. J. GARDNER.
R. W. Cramer & Company, Inc.,
67-69 Irving Place, New York, N. Y.

Men of the Industry

Dr. Coolidge Named Director G.E. Research Laboratory

Dr. William D. Coolidge has been appointed director of the research laboratory of the General Electric Company to succeed Dr. Willis R. Whitney, who has retired from that position owing to poor health after 32 years of service. Dr. Whitney continues as vice-president in general charge of research. The research laboratory was established in 1900 through the executive foresight of

Edwin W. Rice, Jr., then technical director of the General Electric Company. Dr. Whitney was obtained to take charge of the work in that year, going there from the Massachusetts Institute of Technology, where he was an instructor.

The growth of the laboratory began with a new type of incandescent electric lamp, developed by Dr. Whitney himself, and from 1903 it was constantly expanding. His scientific attainments attracted the attention of many institutions of learning and of technical societies and as a result numerous medals and other honors were bestowed upon him.

It was in 1906 that Dr. Whitney persuaded Dr. Coolidge to go to the laboratory from Massachusetts Institute of Technology, and in 1909 Dr. Irving Langmuir joined the staff, going from Stevens Institute of Technology. Through the work of these two scientists such developments as drawn, or ductile, tungsten, the gas-filled incandescent lamp, the modern high-power electronic, or vacuum tube, improved X-ray tubes and atomic hydrogen welding were brought to successful culmination.

Dr. Coolidge is a native of Hudson, Mass. He was trained at Massachusetts Institute of Technology and the University of Leipzig. He was appointed assistant director of the laboratory in 1908 and associate director in 1928. His scientific achievements have won frequent recognition. He has been the recipient of the Edison medal, the Rumford medal, the Homer N. Potts medal, the Lewis Edward Levy gold medal and the Hughes medal from the London Royal Society.

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Westinghouse Elects Vice-Presidents

Following the meeting of the board of directors of the Westinghouse Electric & Manufacturing Company held in New York October 26, President Merrick announced the election of two vice-presidents. C. E. Stephens, formerly commercial vice-president, was named vice-president with headquarters in New York. N. G. Symonds, formerly commercial vice-president at Chicago, was elected vice-president in charge of sales. His headquarters will be at the general offices of the company in East Pittsburgh and, according to the announcement, he will report directly to J. S. Tritle, vice-president and general manager.

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J. B. KILGORE has been named superintendent at Fabens, Tex., for the El Paso Electric Company. Mr. Kilgore has been connected with the Stone & Webster organization since 1916.

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J. J. DONOVAN, manager of the air-conditioning department of the General Electric Company, with headquarters in New York City, has been elected a director of the American Oil Burner Association.

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CLYDE E. HOUSTON, directing head of the Pomona district and eastern division of the Southern California Edison Company, Ltd., since 1926, has been appointed assistant commercial manager in the company's general offices at Los Angeles, Cal. Mr. Houston is a veteran in the Edison company organization, having been with the company and its predecessors since 1904.

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RICHARD E. SMITH has been appointed executive assistant and R. G. KENYON advertising manager of the Southern California Edison Company, Ltd. Mr. Smith and Mr. Kenyon previously were advertising manager and assistant advertising manager respectively. Mr. Smith became associated with the electrical industry in California in 1915 when he was engaged as an illuminating engineer by the Pacific Light & Power Corporation, Los Angeles. He later was sales manager for the Mt. Whitney Power & Electric Company and was appointed advertising manager for the Southern California Edison Company in 1921. Mr. Kenyon joined the Edison organization in the Los Angeles general office in 1917.

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R. H. PARK, formerly electrical engineer with the Stone & Webster Engineering Corporation, Boston, Mass., is now affiliated with the Calco Chemical Company of Bound Brook, N. J., where he is engaged in research in mathematical physics and the design of equipment. Mr. Park's work with Stone & Webster included design and operating problems in connection with various plant, structure and equipment projects.

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OBITUARY

R. F. Schuchardt

Rudolph F. Schuchardt, whose death was announced in the October 29 issue of the ELECTRICAL WORLD, occupied an outstanding position in the electrical industry for a number of years. As chief electrical engineer of the Commonwealth Edison Company since 1909, he contributed substantially to the development of all phases of that utility's business. His work in laying out new

stations and in solving problems in protection and distribution gave him the experience and knowledge that have made his services so valuable to technical organizations.

As early as 1897 Mr. Schuchardt attracted attention when, although he had just been graduated from college, he presented an able paper before the Northwestern Electrical Association entitled "Electricity Meters of Today." This was just the initial step in a career of active participation in the work of national and local associations, both electrical and otherwise. The highest honor of the electrical industry, the presidency of the American Institute of Electrical Engineers, was bestowed

upon Mr. Schuchardt in 1928 after he had served on various important committees, including development, protective devices, transmission and distribution, standards and educational. He was a past-chairman of the Chicago section of the Illuminating Engineering Society, past-chairman of the Technical National Section of the National Electric Light Association and a member of various committees thereof, a member of the Western Society of Engineers, the Society for the Promotion of Engineering Education and the Institution of Electrical Engineers of Great Britain. He was a former chairman of the public affairs committee of the American Engineering Council and in 1929 was a delegate to the World Engineering Congress in Japan.

Mr. Schuchardt was born in 1875 and received his education in public and private schools in Milwaukee and at the University of Wisconsin. The complexity of his work with the Commonwealth Edison Company furnished excellent material for the many articles which appeared under his name in the technical press. He also held several patents on electrical instruments and relays.

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D. H. Braymer

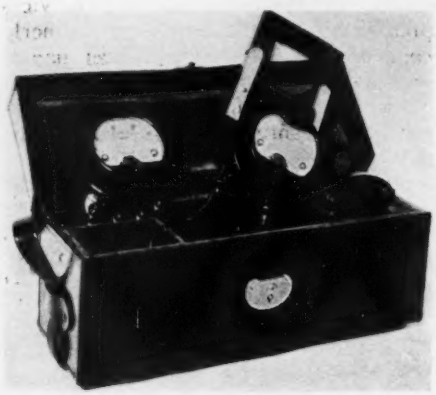
Daniel H. Braymer, head of D. H. Braymer Equipment Company with headquarters in Omaha, Neb., and some few years ago an editor of the ELECTRICAL WORLD, died October 29 in his forty-ninth year. Mr. Braymer's business career was devoted essentially to the industrial engineering field, and for this work he was admirably fitted by education and training. A native of New York State and a graduate of Cornell University, he obtained his early experience with the Westinghouse Electric & Manufacturing Company, the Electrical Testing Laboratories and the Western Electric Company. It was during his connection with the Western Electric that he became interested in editorial work and severed his association with the manufacturing company to join the staff of the *Southern Electrician*. In 1915 he joined the McGraw-Hill Publishing Company as engineering editor of the ELECTRICAL WORLD, later becoming managing editor and co-editor.

When the *Electrical Review* was purchased by the McGraw-Hill company Mr. Braymer was placed in charge of both the publishing and editorial policies of the newly purchased magazine, which started under the name of *Industrial Engineer*. Mr. Braymer relinquished his editorial duties in 1925 to organize the company which bears his name, specializing in consulting and sales work associated with power applications in industrial plants, large buildings and power plants.

New Equipment Available

Testing Kit with Clip-on Ammeter and Voltmeter

A complete testing kit comprised of a dual range clip-on ammeter and a three-range portable voltmeter is announced by Ferranti, Inc., New York. The clip-on meter has two scales, 0/100 and 0/500 amp., and reads accurately currents ranging from 10 to 500 amp. without the necessity of breaking the circuit or the use of split-core current transformers. The instrument is simply clipped over the conductor and the current is read off directly. It can be operated with one hand and is suitable for use either on the ground or up a pole.



The second instrument in the set, the triple-range portable voltmeter, has full scales of 150, 300 and 600 volts, which takes care of the standard distribution voltages of 110, 220, 440 and 550. This meter, although of the moving iron type, has a comparatively high resistance, making its readings accurate. It is suitable for use on either d.c. or a.c. and is independent of frequency between 25 and 100 cycles.

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HEALTHFUL SUNBURN in twenty minutes merely by the flip of a switch is claimed for a new kind of glass used for the bulbs of ultraviolet lamps according to the Westinghouse Lamp Company, New York. Termed as soft glass, it melts at a much lower temperature than the so-called hard glass and transmits 50 per cent more of the ultraviolet energy generated by the lamp.

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CAPACITORS FOR POWER-FACTOR CORRECTION, treated and filled with "Pyranol," an entirely new dielectric liquid, are announced by the General Electric Company. The individual capacitor unit consists of one or more flattened rolls of paper and aluminum foil, pressed together, and inclosed under "Pyranol" in a hermetically sealed steel case. The rolls, each having two sheets of foil separated by thin laminations of paper, are connected in either one, two or three groups for single, two or three-phase units, respectively.

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Fluid Meters Measure Steam, Water and Gases

Fluid meters for the measurement of steam, water, gases and other fluids have been announced by the Bailey Meter Company, Cleveland, Ohio. Three general combinations of meters are available—indicating and integrating, recording and integrating and indicating, recording and integrating.

Some of the features of these meters are: Permanent calibration is assured, since adequate protection against sudden surges or reversals of flow is provided; the cases have been arranged to permit mounting either on the surface or a wall or panel, or flush on a panel as desired; auxiliary recorders, such as for temperature pressure, vacuum or draft, may be easily installed in the case to give a record of these factors on the same chart with the rate of flow, etc.

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Store Lighting Simplified by Several New Units

Offered as a means of securing light distribution on articles of merchandise with minimum complexity the new Holophane grocery and drug store light of the Holophane Company, Inc., New York, consists of an obliquely mounted sphere ceiling suspended on a $\frac{5}{8}$-in. stem. One-half of the sphere is a specially designed clear crystal prismatic reflector resting in a circular frame attached to the opaque half by means of a hinge and latch. Internally the unit comprises an aluminum oxide reflector with a medium base receptacle properly positioned to take a 200-watt lamp. Relamping is effected by lowering the thumb screw and swinging the prismatic hemisphere on the hinge. One of these lights installed directly over the center of a display counter will distribute light on the counter and to vertical display areas behind.

Holophane has also recently developed a trough show window unit consisting of three prismatic reflectors mounted with a white glass panel on one side which may bear a sign. This unit thus provides both window lighting and an illuminated sign.